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Astounding SCIENCE FICTION

DECEMBER 1948
25 CENTS

GENIUS BY POUL ANDERSON

STREET & SMITH'S ASTOUNDING SCIENCE-FICTION DECEMBER 1948

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SCIENCE FICTION
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NEXT ISSUE ON SALE DECEMBER 21, 1948

AST—1A

BROOKHAVEN LABORATORIES

At what was, during the war, Camp Upton on Long Island, there is now in process of development and building, the Brookhaven National Laboratories of the Atomic Energy Commission. The entire operation is a civilian undertaking; the Associated Universities, Incorporated is the contractor—an organization made up by a number of the major Eastern universities. The work planned is purely theoretical-science in nature; the entire plant is devoted solely to learning on the theoretical level, not on the technological level, nor to production work. They will produce no useful power output, no plutonium for external use. The only useful product of material nature will be the various radioactive isotopes. The sole intended product is a better theoretical understanding of what an atom is.

In the latter part of July, the pile was still a-building; the pile laboratory building was a raw orange-red steel framework, only beginning to clothe itself in brick and concrete. The stack which will discharge radioactive waste gases high above the laboratory was only a truncated base some sixty feet high—and most of the laboratories were the ex-barracks of Camp Upton, sketchily reworked for lab use. Work of major importance is already under way there, of course, and new laboratories are being built. The ex-barrack labs are fine, of course, for "cold" labs—very low-level or completely nonradioactive work. But "warm" and "hot" labs are being built; you can't convert any normal building to a "warm" or "hot" lab—they call for eighteen-inch to four-foot concrete walls.

Incidentally, a "warm" lab operates with radioactives up to a maximum of about ten curies; a "hot" lab goes from there up to about one hundred curies. Above one hundred you don't use a lab; you use permanent process equipment, completely automatic and deeply buried. The distinction between "warm" and "hot" might be said to be the point at which the operating chemist has a chance to run away from a laboratory spillage. Radioactives are dangerous to work with—like the high-voltage equipment electrical engineers, radio hams, and physicists normally work with. Up to about four hundred volts, a radio man, for instance, can get a severe jolt if he makes a mistake, but can usually survive. Above one thousand volts, however, if he makes contact by accident his chances of survival are practically *non est.*

In radiation chemistry, a laboratory accident causing spillage of a sample exposes the radio chemist to deadly radiation. Naturally, at that juncture the chemist turns and runs, not walks, to the nearest exit. Now while running, he is exposed to radiation—the intensity on his body

falling off due to the rapidly increasing inverse square effect, and to the rapidly increasing thickness of radiation-absorbing air between said radiochemist and the spilled source of radiation. However, there will be some quantity of radioactive material such that the total exposure he collects in the few seconds time required in turning and running away will exceed the maximum survivable dosage. That quantity is a sort of "inescapable danger quantity"—a sort of critical mass. (The mass will actually vary with the isotope involved. Very little of one of the viciously active, short-lived high-energy gamma emitters can be just as dangerous as a large quantity—several pounds—of a long-lived, low-energy gamma emitter. And a low-energy beta emitter like Carbon-14 would never constitute such a hazard because even a few inches of air is adequate shielding.) The difference between a "warm" lab and a "hot" lab is that, in a "hot" lab the quantities worked with constitute an inescapable danger. The "hot" labs are, therefore, operated remotely, with the operator always completely outside the lab—he's *always* beyond the danger distance. No spillage, flask-breakage, or the like can menace him.

In the "warm" labs, the operator is inside the lab, operating by periscope, bent tongs, et cetera, over a thick lead wall that stands between him and the materials he's working with. If there is a faulty flask, a defective piece of equipment, the chemist can duck out of the lab quickly enough to be perfectly safe. The entrance to the lab, incidentally, consists of a narrow corridor, one wall of which is the eighteen-inch concrete wall of the lab itself, the other being a parallel eighteen-inch concrete wall; the doorway—with no door to slow up a man in a hurry—makes a sharp right-angle bend. Gamma rays don't turn corners; a man in a hurry can.

The extent of the chemical laboratories at Brookhaven is a strong reminder that, while the nuclear physicist is the man currently in the headlines, it's the radiochemist who supplies much of the essential data. Be it remembered that Enrico Fermi was the nuclear physicist who first bombarded uranium with neutrons. But it was the radiochemist team of Hahn and Strassman who proved that barium was produced, and thereby showed the physicists that what they had was uranium fission, not simply a building of a new element. When a cyclotron bombards element X with particles of type A, a radioactivity appears. It takes a radiochemist, though, to determine by chemical tests that the activity is associated with a chemical element Z, and not element Y as the physicist had supposed. The radiochemist supplies much of the invaluable data on which physicists must work—and also supplies the elements the physicist requires. Refining the super-pure uranium for the pile was a chemist's job. One

(*Continued on page 160*)

GENIUS

BY POUL ANDERSON

A colony of geniuses would, they felt, make an interesting study for the psychologists. It did indeed—in a way!

Illustrated by Cartier

"The experiment has been going on for almost fifteen hundred years," said Heym, "and it's just starting to get under way. You *can't* discontinue it now."

"Can and will," replied Goram, "if the situation seems to justify it. That's what I'm going to find out."

"But—one planet! One primitive planet! What sort of monsters do you think live there? I tell you, they're people, as human as I—" Heym paused. He had meant to add—"and you," but couldn't quite bring himself to it. Goram seemed less than human, an atavistic remnant of screaming past ages, an ape in uniform. "—as I am," finished Heym.

The hesitation seemed lost on Goram. The marshal stood regarding the psychologist out of sullen

little black eyes, blocky form faintly stooped, long arms dangling, prognathous jaw thrust ahead of the broad flat-nosed countenance. The fluorotubes gleamed down on his shining shaven bullet skull. The black gold-braided uniform fitted him closely, a military neatness and precision that was in its way the most primitive characteristic of all.

He said in his hoarse bass: "So are the rebels. So are the barbarians and pirates. So are the serfs and slaves and criminals and insane. But it's necessary to suppress all of them. If Station Seventeen represents a menace, it must be suppressed."

"But what conceivable danger—One barbarian planet—under constant surveillance throughout its history! If that can menace an empire of a hundred thousand star systems, we're not safe from anything!"

"We aren't. For three thousand years of history, the Empire has been in danger. You have to live with it, as we soldiers do, to realize how ultimately unstable the stablest power in history really is. Oh, we can smash the peripheral barbarians. We can hold the Taranians and the Comi and Magellanics in check." The marshal's heavy-ridged eyes swept contemptuously up and down the scientist's long weedy form. "I'm in no danger from you. I could break you with my bare hands. But a dozen viruses of Antaric plague, entering my body and multiplying, would paralyze me in agony and rot the flesh off my bones and probably empty this ship of life."

The office quivered, ever so faintly. The muffled throb of the great engines was vibrant in its walls and floor and ceiling, in the huge ribs and plates of the hull, in guns that could incinerate a continent and the nerves and bones of the two thousand men manning that planetoidal mass. Monstrously the ship drove through a night of mind-cracking empty distances, outpacing light in her furious subdimensional quasivelocity, impregnable and invincible and inhuman in her arrogance. And a dozen blind half-living protein molecules could kill her.

Heym nodded stiffly. "I know what you mean," he said. "After all"—deliberate snobbery edging his voice—"applied psychological science is the basis of the Empire. Military power is only one tool for—us."

"As you will. But I am not a researcher's tool, I belong to practical men, and they have decided this mission. If I report Station Seventeen potentially dangerous, they will order me to destroy it. If I decide it is already dangerous, I have the authority to order it destroyed myself."

Heym kept his gaunt face impassive, but for a moment he felt physically ill. He looked across the sparsely furnished office at the marshal's squat simian form, he saw the barely suppressed triumph-smile in the heavy coarse visage, and a wave of sick revulsion swept over him.

He thought wearily: *Fifteen hundred years . . . patience, work, worry, heartbreak, and triumph and a gathering dawn . . . generation after generation, watching from the skies, learning, pouring their whole lives into the mighty project— As if I didn't know the danger, the fear which is the foundation and the reason for the Empire . . . and here we have the first glimmerings of what may be a way out of the rattrap which history has become . . . and it's now all dependent on him! On the whim of a two-legged animal which will strike out in blind fear to destroy whatever it doesn't understand . . . or even understanding, will destroy just for the satisfaction of venting an inferiority complex, of watching better men squirm in pain.*

Calmness came, a steadiness and an icy calculation. After all, he thought, he was a psychologist and Goram was a soldier. It should be possible for him to handle the creature, talk him over, deftly convince him that he himself wanted what Heym wanted and had in fact thought of it himself and had to argue the scientest into agreement.

Yet—slow, easy, careful. He, Sars Heym, was a research man, not a practicing psychotechnician. He wasn't necessarily able to handle the blind brutal irrationality of man, any more than a physicist was ordinarily capable of solving an engineering problem. And so much depended on the outcome that . . . that—

Briefly, he sagged beneath the burden of responsibility. The load seemed for a dizzying instant too much to bear—unfair, unfair, to load one man with the weight of all the future. For Station Seventeen was the key to the next phase of history—of that Heym was certain. The history of man, his evolution—the whole universe seemed to open vertiginously before him, and he stood alone with the cosmos blazing on his shoulders.

He shook himself, as if to get rid of a clinging burden, and with a convulsive effort forced coolness on himself. Detached argument—well, he had used that often enough at Sol without convincing anyone who mattered. He could still use it on Goram, but not for itself, only as a means of flattery by appealing to reason—among other means.

Intolerable, to have to play sycophant to this—atavist—but there was too much at stake for pride to count.

"I understand your position, of course," said Heym, "even if I do not agree. I am sure that a glance at our records will convince you there is no danger."

"I'm not interested in records," rasped the marshal. "I could have had all that transvised to me at Sol if I wanted to see it. But that's the psychologists' department. I want to make a personal inspection."

"Very well. Though we could just as well have transvised the

scenes revealed on the spy devices from our headquarters to Sol."

"I'm not interested in telescreen images either. I want to land on the planet, see its people with my own eyes, hear them talk, watch them at work and play. There's a *feel* to a race you can only get by direct observation." Goram's bulldog face thrust aggressively forward. "Oh, I know your fancy theories don't include that—you just watch from afar and write it all down in mathematical symbols nobody can read without twenty years of study. But I'm a practical man, I've dealt with enough barbarians to have an instinct for them."

Superstition! thought Heym bitterly. *Typical primitive mind reaction—magnifying his own ignorant guesses and impulses into an "instinct": No doubt he also believes hair turns gray from fear and drowned men always float face down. Behold the "practical man"!*

It was surprisingly hard to lie, after a lifetime's training in the honesty of science and the monastic community of observers at the station. But he said calmly enough: "Well, that's very interesting, Marshal Goram. We've often noticed curious talents—precognition, telepathy, telekinesis, and the rest, appearing sporadically among people who have some use for them, but we've never been able to pin them down. It's as if they were phenomena inaccessible to the ordinary scientific method. I see your point."

And I flatter myself that's good flattery—not too obviously in agreement, but still hinting that he's some kind of superman.

"Haven't you ever landed at all?" asked Goram.

"Oh, yes, fairly often—usually invisible, of course, but now and then making an open and even spectacular appearance to test the effects of seemingly supernatural manifestations. However, we can generally see quite enough through the strategically planted recording televisors and other spy devices."

"You think," grunted Goram. "But a planet is mighty big, I tell you. How do you know what they're cooking up in places your gadgets don't see?"

Heym was unable to keep all the weariness and disgust out of his voice. "Because history is a unity," he said. "The whole can be inferred from the part, since the part belongs to the whole. Why should the only unwarlike people in the Galaxy suddenly start building weapons?"

"Oh, we don't fear their military power—yet," replied Goram. "I should think you, as a psychologist, would know what sort of a danger Station Seventeen represents—a danger that can wreck civilization. They can become a *disrupting factor*—the worst in all history."

"Progress *is* disruption."

"Maybe. But the Empire is based on stasis. It's sacrificed progress for—survival."

"True—but here we may have a clue to controlled progress, safe ad-

vancement. Even stasis isn't safe, as we well know. It's a poor makeshift, intended to keep civilization alive while something else is worked out. Well—we're working it out at Station Seventeen."

Goram grunted again, but remained silent.

Valgor's Star lay a good hundred parsecs from Sol, not far from the Empire's border though sufficiently within the garrisoned marches to be protected from barbarian raids. The early researchers, looking for an uninhabited Earth-like planet, had found the obscure GO-type sun far off the regular space lanes; an ancient planetographic expedition had stopped briefly there, recording that the third world was practically terrestrial, but this whole galactic sector was so isolated and unprofitable that there had been no further visits, and the old report lay for centuries in the Imperial files before the Psychotechnic Foundation resurrected it. The remoteness and unknownness were assets in any such project, and the fact that there were no aborigines requiring troublesome and costly extermination and eradication of all traces had been decisive.

At an easy cruising speed, the battleship used three days going from Sol to Valgor's Star. Sars Heym spent most of that time getting on the right side of Tamman Goram. It involved listening to endless dreary reminiscing of border warfare and the consummate ability required to rise from simple conscript to Imperial Marshal, but the price was small if it could save Station Seventeen.

"Nobody appreciates the border garrisons who hasn't served in them," declared Goram, "but I tell you, if it weren't for them the Empire wouldn't last a year. The barbarians would sweep in, the rival empires would gobble up all they could hold and go to war over the spoils, the Spirit alone knows what the Magellanics would do—but it wouldn't be pleasant—and the whole structure would disintegrate—three thousand years of stability might as well never have been!"

A high official would be used to open flattery. Heym disagreed just enough to seem sincerely to agree on all important points. "We couldn't do without the border patrols," he said, "but it's like any organism, requiring all its parts to live—we couldn't dispense with internal police either, and certainly not with the psychotechnicians who *are* the government."

"Spirit-damned bureaucrats," snorted Goram. "Theoreticians—what do they know of real life? Why, d'you know, I saw three stellar systems lost once to the barbarians because we didn't have enough power to stand them off. There was a horde of them, a dozen allied suns, and we had only three garrisoned planets. For months we begged—wrote to Antares and Sirius and Sol itself *begging* for a single Nova-class battleship. Just one, and we could have beaten off their fleet

and carried the war to them. But no, it was 'under consideration' or 'deferred for more urgent use'—three suns and a hundred thousand men lost because some soft-bellied psychotechnician mislaid a file."

"Robot-checked files don't get mislaid," said Heym softly. "I have friends in administration, and I've seen them weep at some of the decisions they had to make. It isn't easy to abandon an army to its fate—and yet the power that could have saved them is needed elsewhere, to drive off a larger invasion or to impress the Taranians or to take a star cluster of strategic value. The Empire has sacrificed a lot for sheer survival. Humanness in government is only one thing lost."

"The rules! How can a general in the field keep track of every ship and turn in forms in quadruplicate on their condition?"

"He can't. Probably a million units a year are lost in recording. And yet, the vast majority of such forms *are* filled out and *do* get to the appropriate center, are recorded in electronic code and put on instantly accessible file, mathematically coordinated with all other relevant information. When Grand Strategy wants an overall picture of the military situation, it has one right there. Military planning would be impossible otherwise.

"And it isn't only in the military field," argued Heym. "After all, you know the Empire isn't interested in further expansion. It wants to keep civilization alive on the planets where it exists, and keep the nonhuman imperia out. Ever since the Founder, our military policy has been basically defensive—because we can't handle more than we have. The border is always in a state of war and flux, but the Empire is at peace, inside the marches.

"Yet—how long would the Empire last, even assuming no hostile powers outside, without the most rigid form of psychotechnocratic government? There are roughly three times ten to the fourteenth power humans in the Solarian Empire. The nonhuman aborigines have been pretty thoroughly exterminated, assimilated as helots, or otherwise rendered harmless, but there are still all those humans, with all the terrific variations and conflicting desires inherent in man and intensified by radically different planetary and consequently social environments. Can you imagine a situation where three hundred trillion humans went their own uncoordinated ways—with atomic energy, biotoxic weapons, and interstellar spaceships to back up their conflicting demands?"

"Yes, I can," said Goram, "because after all it has happened—for nearly a thousand years before the Empire, there was virtual anarchy. And"—he leaned forward, the hard black glitter of his eyes nailing Heym—"that's why we can't take chances, with this experiment of yours or anything else—anything at all. In the anarchic centuries, with a much smaller population, there was

horror—many planets were blasted back to savagery, or wiped out altogether. Have you seen the dead worlds? Black cinders floating in space, some still radioactive, battlegrounds of the ancient wars. The human barbarians beyond the Imperial borders are remnants of that age—some of them have spaceships, even a technology matching our own, but they think only of destruction—if they ever got past the marches, they'd blast and loot and fight till nothing was left. Not to mention the nonhuman border barbarians, or the rival empires always watching their chance, or the Magellanics sweeping in every century or so with weapons such as we never imagined. Just let any disrupting factor shake the strength and unity of the Empire and see how long it could last."

"I realize that," said Heym coldly. "After all, I *am* a psychologist. I know fully what a desperate need the establishment of the Empire filled. But I also know that it's a dead end—its purpose of ultimate satisfied stasis cannot be realized in a basically dynamic cosmos. Actually, Imperial totalitarianism is simply the result of Imperial ignorance of a better way. We can only find that better way through research, and the project at Station Seventeen is the most promising of all the Foundation's work. Unless we find some way out of our dilemma, the Empire is doomed—sooner or later, something will happen and we'll go under."

Goram's eyes narrowed. "That's near lese majesty," he murmured.

Heym laughed, and gave the marshal a carefully gauged you-and-I-know-better-don't-we look. "The Imperium is tolerant of local gods," he said, "but the divinity of the Emperor must be acknowledged and is taught in all schools. Why? Because a state church, with the temporal ruler as the material incarnation of the Spirit, is another hold on the imagination of the people, another guarantee of subservience. So are local garrisons; political indoctrination, state control of commerce and travel, careful psychotechnic preparation and supervision of amusements, rigid limitation of birth but complete sexual freedom as an outlet, early selection and training of all promising children for government service—with unlimited opportunities for advancement *within* the established framework—and every other thing we can possibly control. If you stop to think about it—the Empire is founded on mediocrity."

"That's as may be," muttered Goram, "but in that case a planet full of geniuses becomes doubly dangerous."

Heym went over to the wall of the officers' lounge and touched a button. The telescreen sprang to life with a simulacrum of the outside view. An uncounted host of stars blazed against the infinite blackness, a swarming magnificent arrogance of unwinking hard jewels strewn across the impassive face of eternity.

The Milky Way foamed around the sky, the misty nebulae and star clusters wheeled their remote godlike way around heaven, and the other galaxies flashed mysterious signals across the light-years and the centuries. As ever, the psychologist felt dwarfed and awed and numbed by the stupendous impact.

"It was a great dream," he whispered. "There never was a higher dream than man's conquest of the universe—and yet like so many visions it overleaped itself and shattered to bits on the rocks of reality —in this case, simple arithmetic defeated us. How reconcile and coordinate a hundred thousand stars except by absolutism, by deliberate statism—by chaining ourselves to our own achievements? What other answer is there?"

He turned around to Goram. The soldier sat unmoving, face stonehard, like a primitive idol. "We're looking for a new way," said Heym. "We think we're finding it, at Station Seventeen. It's the first hope in four thousand years."

The planet might almost have been Earth, a great blue spheroid swinging majestically against the incredible spatial sky with a softly shining moon for companion. Auroras wavered over the ice-capped poles, and cloud masses blurred the greenish-brown continents. They were storms, those clouds, snow and rain and wind blowing out of a living heaven over broad fair fields and haughty mountains, and looking down from the sterile steel environment of the ship, remembering the world city sprawling over Earth and the cold hard mechanized pattern of all Imperial life, Heym felt a brief wistfulness. All at once, he envied his experimental animals, down there on the green young planet. Even if they were to be destroyed, they had been more fortunate than their masters.

But they wouldn't be destroyed. They mustn't be.

"Where is your observation post?" asked Goram.

"On an asteroid well away from here and rendered invisible."

"Why not on the satellite? It'd be a lot closer."

"Yes, but distance doesn't mean anything to a transvisor. Also, if—when—the colonists learn the means of interplanetary travel, we'd have had to move off the Moon, while we can remain hidden indefinitely on the invisible planetoid."

"I'd say 'if' rather than 'when'," amended Goram grimly. "It was your report that the inhabitants were experimenting with rockets that alarmed the rulers enough to order me here to see if it weren't best simply to sterilize the planet."

"I've told you before, there's no need for alarm," protested Heym. "What if the people do have a few rocketships? They have no reason to do more than visit the other worlds of this system, which aren't habitable—certainly no reason to colonize, with their own planet still practically uninhabited. The present

population is estimated at only some eight hundred million."

"Nevertheless, as soon as they have a whole system to move about in they'll be dangerous. It'll no longer be possible to keep track of everything of importance they may do. They'll be stimulated by this success to perfect an interstellar drive—and even you will agree that that cannot be permitted. That engine may be developed without our knowledge, on some remote world of this system—and once even a few of them are running loose between the stars we'll have no further control—and the results may well be catastrophic! Imagine a pure-bred line of geniuses allied with the barbarians!"

"I tell you, they're not warlike. They haven't had a single war in all their history."

"Well, then they'll try to innovate within the Empire, which would be just as bad if not worse. Certainly they won't be satisfied with the status quo—yet that status quo means survival to us."

"They can be co-ordinated. Good Spirit, we have plenty of geniuses in the Galaxy today! We couldn't do without them. They are the very ones who run the Empire. Advancement is on a strict merit basis simply because we *must* have the best brains of mankind for the gigantic job of maintaining the social order."

"Sure — everyone's strictly brought up to accept the Empire, to identify its survival with its own. We have plenty of tame geniuses. But these are wild—a planetful of undomesticated intellects! If they can't be tamed, they must be killed."

"They can be," insisted Heym. "Rather, they can become the leaders to get us out of status quo safely—if not directly, then indirectly through knowledge gained by observing them. Already administrative techniques have been improved, within the last five hundred or so years, because by watching unhampered intellect at work we have been able to derive more accurate psychomathematical expressions for the action of logic as a factor in society. A group in the Psychotechnic Foundation is working out a new theory of cerebration which may become the basis of a system of mind training doubling the efficiency of logical processes—just as semantic training has already increased mind power by applying it more effectively. But in order to develop and test that theory, as well as every other psychological research project, we must have empirical data such as the observation stations, above all Seventeen, furnish us. Without such new basic information, science comes to a standstill."

"I've heard it all before," said Goram wearily. "Now I want to go down there and look."

"Very well. I'll come along, of course. Do you wish to take anyone else?"

"Do I need to?"

"No, it's perfectly safe."

"Then I won't. Meet me at Lifeboat Forty in half an hour." Goram

tramped off to give such orders as might be needed.

Heym stood for a while, chain smoking and looking out the visiplate at the silently rolling planet. Like an ominous moon, the warship swung in an orbit just beyond the atmosphere. For all its titanic mass, it was insignificant against the bulk of a world. Yet in guns and bombs and death-mists, gravitational beams and long-range disintegrators and mass-conversion torpedoes, in coagulative radiations and colloid-resonant generators, in the thousand hells man had made through all his tormented existence, lay the power to rip life off that surface and blanket the shuddering continents in smoke and flame and leave the blackened planet one great tomb under the indifferent stars.

No—no, that was wrong. The power did not lie in the ship, it was inert metal and will-less electronic intellect, a cosmic splinter that without man would spin darkly into eternity. The will, and hence the power, to destroy lay in men—in one man. One gorilla in uniform. One caveman holding a marshal's baton. One pulsing mass of colloidal tissue, ultimately unstable, not even knowing its own desire.

Heym scowled and drew heavily

on his cigarette. Goram had been soothed into comparative geniality, but his frantic notion of death as panacea was as strong as ever. The creature wasn't even consistent—one moment talking philosophy of history as if he had brains, the next snarling his mindlessly destructive xenophobia. There was something wrong about Goram—*Though it might only be my own ignorance of practical psychology,* thought Heym. *As a research man, I'm used to dealing with only one factor at a time. A situation in life is really too complex for me—I don't have enough rules of thumb. I wish I'd brought a practicing technician along, say Kharva or Junn—they'd soon analyze the mental mechanism of our marshal and push the appropriate buttons.*

The old sickening fear fell anew on him. What if, after all, he should fail—what if fifteen hundred years of work were to be sponged out at the arbitrary whim of a superstition-ridden military moron? *If I fail, the Empire fails with me—I know it. And it isn't fair! I should have been told what I was being recalled to Sol for. I should have had a chance to prepare my arguments better. I should have been allowed to take a practical psycho along—but no, they obviously couldn't permit me to do that or I'd have had everything my own way.*

But couldn't they see? Can't they understand? Or has the worship of statism penetrated so deep that it's like an instinct, a blind need for which everything else must be sacrificed?

He turned and went heavily toward his cabin to make ready.

Screened by an invisibility field, the lifeboat spiraled down toward the surface. Goram let the robopilot handle the vessel, and spent most of his time peering through a field-penetrating visiscope.

"Not much sign of habitation," he said.

"No, I told you the population was still small," replied Heym. "After all, only a few thousand were planted originally and the struggle for existence was as hard as with any savages for the first few centuries. Only lately has the population really begun growing."

"And you say they have cities now—machines—civilization? It's hard to believe."

"Yes, it is. The whole result has been a triumphant confirmation of the psychotechnic theory of history, but nevertheless the sheer spectacular character of the success has awed us. I can understand it's a little frightening. One naturally thinks a race which can go from naked savages to mechanized civilization in fifteen hundred years is somehow demonic. Yet they're humans, fully as human as anyone else in the Galaxy, the same old Earthly stock as all men. They've simply enjoyed the advantage of freedom from stupidity."

"How many stations are there?"

"About a hundred—planetary colonies, with colonists in ignorance of their own origin, where various special conditions are maintained. Different environments, for instance, or special human stocks. The progress of history is being observed on all of them, secretly, and invaluable data on mass-psychologic processes are thereby gained. But Seventeen has been by far the most fruitful."

Goram wrinkled his low forehead. With concealed distaste, Heym thought how very like an ape he looked—throwback, atavist, cunning in his own narrow field but otherwise barely above moron level—typical militarist, the biped beast who had ridden mankind's back like some nightmarish vampire through all history—except on the one planet of Valgor's Star—

"I don't quite see the point," admitted the marshal. "Why spend all that time and money on creating artificial conditions that you'd never meet in real life?"

"It's the scientific method," said Heym, wondering at what elementary level he would have to begin his explanation. How stupid could one be and hold a marshal's position?" The real world is an interaction of uncounted factors, constantly changing in relation to themselves and each other, far too vast and complex to be understood in its entirety. In order to find casual relationships, the scientist has to perform experiments in which he varies only one factor at a time, observing its effect—and, of course, running control experiments at the same time. From these data he infers similar relationships in the real world. By means of theoretical analysis of observed facts he can proceed to predict new phenomena—if these predictions are borne out by further observation, the theory is probably—though never certainly—right, and can be used as a guide in understanding and controlling the events of the real world."

In spite of himself, Heym was warming up to his subject. After all, it was his whole life. He went on in a gathering rush of words:

"All the evidence shows that reality is not object but process. You yourself are not the same object as an instant ago—physico-chemical-psychological changes, the very change of entropy which is 'time,' are all continuous. They are rapid in the case of an organism, slow in the case of a rock, say, but always continuous. The object is an abstraction, a set of constant characteristics of a process—more or less constant, I should say, since nothing is permanent, change, process, is always continuous. The grammatical distinction between noun and verb has misled us to think there is a corresponding distinction between what an object is and what it does—completely false, as a moment's reflection will show."

"Hm-m-m" Gorman looked out the visiscope. The boat was sweep-

ing over a broad plain, yellow with ripening grain. A few primitive villages, houses built of stone and wood and brick, were scattered over the great landscape, a peaceful scene, reminiscent of civilization's dawn. "The planet *looks* backward enough," grunted Goram dubiously.

"It is," said Heym eagerly. "I assure you it is."

"Well . . . you were saying—" Goram didn't look at all sure of what Heym had been saying. "Get to the point."

"Civilization—history, if you will—is a process like all else." resumed the scientist. "A nation is not a concrete object, a giant man, a god or All-Father to whom one owes fanatical loyalty and unquestioning obedience. How much misery could have been prevented if men had seen that simple, common sense fact! A nation is part of a culture, and a culture is an interaction of certain peoples with themselves, their neighbors, and their 'natural' environment over a space-time region. When the process has lost its distinctive characteristics, its continuity of development, we say the culture is dead, but that is only a convenient figure of speech. Actually causality is indefinitely extended. We are still influenced by events that occurred in prehistoric ages.

"The early students of culture were struck by the similarity of development of different civilizations, as if man went along one inevitable historic path. And in a way he did—because one thing leads to another. The expanding units of a culture clash, there are ever fiercer wars, old fears and grudges intensify, economic breakdowns increase the misery, finally, and usually unwittingly and even unwillingly, one nation overcomes all others to protect itself and founds a 'universal state' which brings a certain peace of exhaustion but eventually decays and collapses of its own weaknesses or under the impact of alien invaders. That's exactly what happened to mankind as a whole, when he exploded into the Galaxy—only this time the fearful scale and resources of the wars all but shattered the civilization; and the Solarian Empire, the passive rigidity solving the problems of the time of troubles by force, has lasted immensely longer than most preceding universal states, because its rulers have enough knowledge of mass-psychologic processes to have a certain control over them, and all the power of a hundred thousand planetary systems to back their decisions."

Goram looked a little dazed. "I still don't see what this has to do with the Foundation and its stations," he complained.

"Simply this," said Heym, "that though history is a natural process, like anything else, it is peculiarly hard to understand and hence almost impossible to control. This is not only because of the very complex character of the interactions

but because we ourselves are concerned in it—the observer is part of the phenomenon. And also, it had long been impossible to conduct controlled experiments in history and thus separate out causal factors and observe their unhindered working. On the basis of thousands of years of history as revealed—usually quite incompletely—by records and by archeology, and of extrapolations from individual and mob psychological knowledge, and whatever other data were available, the scientists of the period preceding the Empire worked out a semi-mathematical theory of history which gave some idea of the nature of the processes involved—causal factors and the manner of their action. This theory made possible qualitative predictions of the behavior of masses of men under certain conditions. Thus the early emperors knew what factors to vary in order to control their provinces. They could tell whether a certain measure might, say, precipitate a revolt, or just what phrasing to use in proclamations for the desired effect. If you want a man to do something for you, you don't usually slap him in the face—it's much more effective to appeal to his vanity or his prejudices, best of all to convince him it's what he himself wants to do. But once in a while, a face slapping becomes necessary. Why, even today the barbarians are held at bay more by subtle psychological and economic pressures dividing them against each other and putting them in awe of us than by actual military might."

An ocean rolled beneath the boat, gray and green, shaking its white mane out on the restless horizon. "Swing northeast," said Heym. "The planet's greatest city lies that way, on a large island."

"Good. A city's a good place to observe a people. Can we go around incognito?"

"Naturally. I know the language well enough to pass for a traveler from some other part of the world. There's a lot of intercourse between continents. The cities are quite cosmopolitan."

"Well—go on. You've still not explained why the station and all this rigmarole of secrecy."

"I was laying the background," said Heym, unable to keep all the tiredness out of his voice. *Can I really talk this moron over? Can anyone? Reason is wasted on an ape.* "It's really very simple. The crude psychotechnology available made it possible for the early emperors to conquer most of the human-inhabited Galaxy, hold it together, and reach an uneasy truce with the Taranian and Comi Empires. Our military might can hold off the barbarians and the Magellanic raiders, and have sufficient power left over to police the three hundred trillion citizens.

"Yet our science is primitive. On that vast scale, it can only deal with the simplest possible situations. It's all we can do to keep the Em-

pire stable. If it should develop, on the colossal scale of which it is capable and with all the unpredictable erraticism of the free human mind, it would simply run away from us. We have trouble enough keeping industry and commerce flowing smoothly when we know exactly how it should work. If we permitted free invention and progress, there'd be an industrial revolution every year—there is never a large proportion of discoverers, but with the present population the number would be immense. Our carefully evolved techniques of control would become obsolete, there'd be economic anarchy, conflict, suffering, individuals rising to power outside the present social framework and threatening the co-ordinating authority—with planet-smashing power to back both sides and all our enemies on the watch for a moment's instability.

"That's only one example. It applies to any field. Science, philosophy—we can control known religions, channel the impulses to safe directions—but a new religion, rousing discontent, containing unknown elements—a billion fanatics going to war—No! We have to keep status quo, which we understand, at the cost of an uncontrollable advance into the unknown.

"The Empire really exists only to simplify the psychotechnic problem of co-ordination. Enforcement of population stability—good, we don't have to worry about controlling trillions of new births, there's no land hunger. Stable industry, ossified physical science, state religion, totalitarian control of the entire life span—good, we know exactly what we're dealing with and our decisions will be obeyed—imagine the situation if three hundred trillion people were free to do exactly as they pleased in the Galaxy! Subjugation of nonhuman aborigines, or outright extermination—good, we only have to deal with human-type minds and needs, which are complex enough, not with a million or a trillion psychologies and past histories as wildly different as the planets of origin." Heym shrugged. "Why go on? You know as well as I do that the Empire is only an answer to a problem of survival—not a good answer, but the best our limited knowledge can make."

"Hah!" Goram's exclamation was triumphant. "And you want to turn a world of unpredictable geniuses loose in that!"

"If I thought for an instant there was any danger of this people's becoming a disrupting factor, I'd be the very first to advocate sterilization," said Heym. "After all, I want to live, too. But there's nothing to fear. Instead, there is—hope."

"What hope?" snorted Goram. "Personally, I can't see what you want, anyway. For three thousand years, we've kept man satisfied. Who'd want to change it?"

Heym bit back his temper.

"Aside from the fact that the contentment is like death," he said, "history shows that universal states don't endure forever. Sooner or later, we'll face something that will overwhelm us. Unless we've evolved ourselves. But safe evolution is only possible when we know enough psychotechnics to keep the process orderly and peaceful—when our science is really quantitative. The Stations, and especially Seventeen, are giving us the information we must have to develop such a science."

The island lay a few kilometers north of the great northern continent. A warm stream in the ocean made the climate equable, so that the land lay green in the gray immensity of sea, but polar air swept south with fog and rain and snow, storms roaring over the horizon and the sun stabbing bright lances down through a mightily stooping sky of restless clouds and galloping winds. Heym thought that the stimulating weather had as much to do as the favorable location along the northern trade routes with the islanders' leadership in the planet's civilization.

Many villages lay in the fields and valleys and on the edges of the forest that still filled the interior, but there was only one city, on an estuary not far from the southern coast. From the air, it was not impressive to one who had seen the world cities of Sol and Sirius and Antares, a sprawling collection of primitive, often thatch-roofed dwellings that could hardly have housed more than a million, the narrow cobbled streets crowded with pedestrians and animal-drawn vehicles, the harbor where a few steam- or oil-driven vessels were all but lost in the throng of wind-powered ships, the almost prehistoric airport—but the place had the character, subtle and unmistakable, of a city, a community knowing of more than its own horizon inclosed and influencing events beyond the bounds of sight.

"Can we land without being detected?" inquired Goram.

Heym laughed. "An odd question for a military man to ask. This boat is so well screened that the finest instruments of the Imperial navy would have trouble locating us. Oh, yes, we observers have been landing from time to time all through the station's history."

"I must say the place *looks* backward enough," said Goram dubiously. "The existence of cities is certainly evidence of crude transportation."

"Well"—honesty forced Heym to argue—"not necessarily. The city, that is, the multi-purpose community, is one criterion of whether a society is civilized or merely barbaric, in the technical anthropological sense. It's true that cities as definite centers disappeared on Earth after the Atomic Revolution, but that was simply because such closely spaced buildings were no longer necessary. In the sense of

close relation to the rest of mankind and of resultant co-ordination, Earth's people kept right on having cities. And today the older planets of the Empire have become so heavily populated that the crowded structures are reappearing—in effect, the whole world becomes one vast city. But I will agree that the particular stage of city evolution existing here on Seventeen is primitive."

Goram set the boat down in a vacant field outside the community's limits. "What now?" he asked.

"Well, I suppose you'll want to spend a time just walking around the place." Heym fumbled in a bag. "I brought the proper equipment, clothes and money of the local type. Planetary type, that is —since a universal coinage was established at the same time as a common language was adopted for international use, and nobody cares what sort of dress you wear." He unfolded the brief summer garments, shorts and sandals and tunic of bleached and woven plant fiber. "Funny thing," he mused, "how man has always made a virtue of necessity. The lands threatened with foreign invasion came to glorify militarism and war. The people who had to work hard considered idleness disgraceful. Dwellers in a northern climate, who had to wear clothes, made nudity immoral. But our colonists here are free of that need for compensation and self-justification. You can work, think, marry, eat, dress, whatever you want to do, just as you please, and if you aren't stepping on someone else's toes too hard nobody cares. Which indicates that intolerance is characteristic of stupidity, while the true intellectual is naturally inclined to live and let live."

Goram struggled awkwardly and distastefully into the archaic garments. "How about weapons?" he asked.

"No need to carry them. No one does, except in places where wild animals might be dangerous. In fact, arms are about the only thing in which the colonists' inventiveness has lagged. They never got past the bow and arrow. Aside from a few man-to-man duels in the early stages of their history, and now abandoned, they've never fought each other."

"Impossible! Man is a fighting animal."

Heym tried to find a reply which was not too obviously a slap at the whole military profession. "There's been war on all our other colonies," he said slowly, "and, of course, through all human history—yet there's never been any real, logical reason for it. In fact, at one stage of prehistoric man, the late neolithic, war seems to have been unknown—at least, no weapons were found buried with the men of that time. And your whole professional aim today is to maintain peace within the Empire, isn't it?

"It takes only one to make a quarrel unless the other lacks all

spirit to resist—and a people like these are obviously spirited, in fifteen hundred years they've explored their whole planet. But suppose neither side wants to fight. Whenever two tribes met, in the history of Station Seventeen, they were all too intelligent to suffer from xenophobia or other nonlogical motivations to murder, and certainly they had no logical reason to fight. So they didn't. It was as simple as that."

Goram snorted, whether in disbelief or contempt Heym didn't know. "Let's go," he said.

They stepped out of the boat and its invisibility screen into the field. Tall breeze-rippled grass tickled their bare legs, and the wind in their faces had the leashless wild exuberance and the heady scent of green growing life brought over the many kilometers of field and forest across which it had rushed—incredible, that pulsing warm vitality after the tanked sterility of the ship, of the Empire. And up in the blue cloud-fleeced sky a bird was singing, rising higher and ever higher toward the sun, drunk with wind and light.

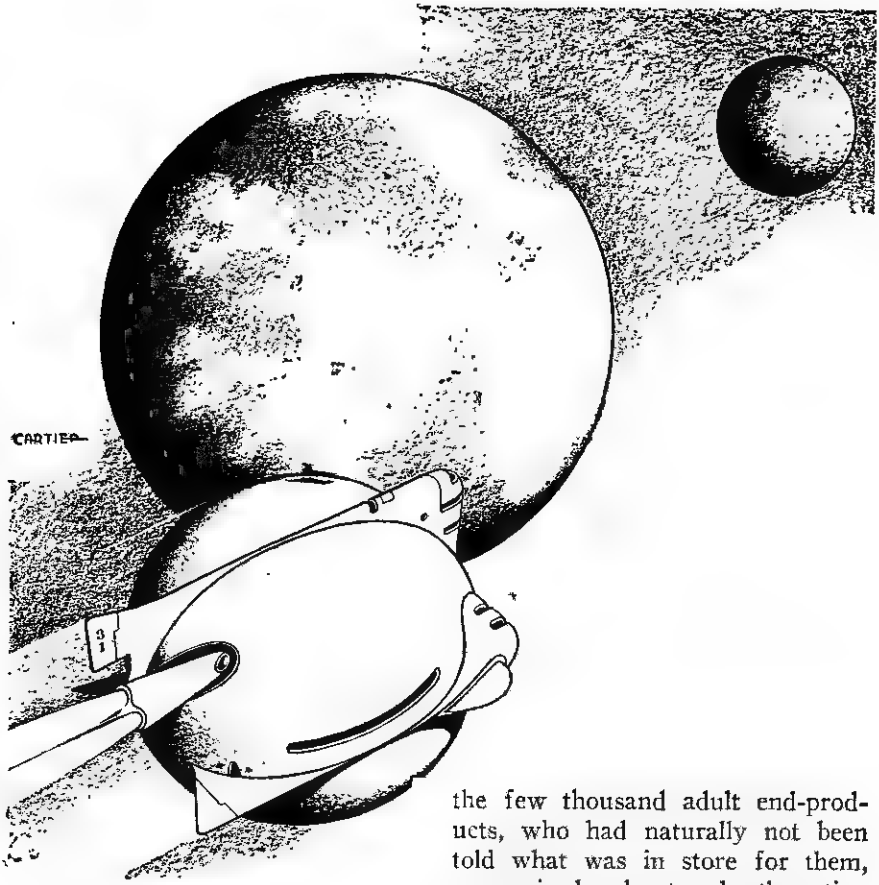
The two men walked across the field to a road that led cityward. It was a narrow rutted brown track in the earth, and Goram snorted again. They walked along it. On a hill to the right stood a farm, a solid, substantial, contented-looking cluster of low tile-roofed stone buildings amid the open fields, and ahead on the horizon was the straggling misty line of the city. Otherwise they were alone.

"Are all your colonies this wild?" asked Goram.

"Just about," said Heym, "though the environments are often radically different—everything from a planet that's barely habitable desert to one that's all jungle and swamp. That way, we can isolate the effects of environment. We even have one world equipped with complex robot-run cities, to see how untutored humans will react. There are three control stations, Earth-like planets where ordinary human types were left, and from them we're getting valuable information on the path which terrestrial history actually took, we can test basic anthropological hypotheses and so on. Then there are a number of planets where different human types are planted—different races, different intelligence levels, and so on, to isolate the effects of heredity and see if there is any correlation of civilization with, say, physiology. But only here on Seventeen, populated exclusively by geniuses, has progress been rapid. All the other colonies are still in the stone ages or even lower, though there have been some unique responses made to severe environmental stimuli."

"And you mean you just dumped your subjects down on all these worlds?"

"Crudely put, yes. For instance, before colonizing Seventeen we—



that is, the Foundation—spent several generations breeding a pure genius strain of man. On Imperial orders, the Galaxy's best brains were bred, and genetic control and selection were applied, until a stock had been developed whose members had only genius in the intellectual part of their heredity. Barring mutation or accident, both negligible, the people here and their children can only be geniuses. Then the few thousand adult end-products, who had naturally not been told what was in store for them, were seized and put under the action of memory erasers which left them able to walk and eat and little else. Then a couple of hundred were planted in each climatic region of this planet, near strategically placed invisible spy devices, and the observers sat back on their asteroid to see what would happen. That was fifteen hundred-odd years ago, but even in the forty or so years I've been in charge the change here has been very noticeable. In fact, on

choosing the proper psychomathematical quantities to represent the various types of progress and plotting them against time, almost perfect exponential curves were obtained."

"Sure. All progress, scientific progress anyway, is exponential."

"Oh, no—quite the contrary. There are only a few sudden, brilliant, and—brief—periods of expansion in human history; long dreary dark ages intervene, and even the times of expansion are irregular. Nor has there ever been any real social progress made—today as in the stone ages, law is based on force, though most of our force is the subtler psychotechnic kind—and even it is not essentially different from the taboo or priestcraft holding earlier cultures in check. I tell you, only on Seventeen has scientific progress been continuous, and only on Seventeen has there been any real social progress at all."

Goram scowled. "So on that exponential advance, you can expect them to work out interplanetary travel in a matter of years," he said. "They'll know the principles of the star drive in a few more generations, and invent a faster-than-light engine almost at once. No—they aren't safe!"

It was strange to walk through the narrow twisting streets and among the high archaic facades of a city which belonged to the almost forgotten past. To Goram, who must have visited uncivilized planets often, it could not be as queer as to Heym, and, also, the military mind would be too unimaginative to appreciate the situation. But even though Heym had spent the better part of his life watching this culture, it never failed to waken in him a dim feeling of dreamlike unreality.

Mere picturesqueness counted for a little, though the place was colorful enough. Along those cobbled ways went the traffic of a world. There were fantastic-looking beasts, variations of the horned ungulate genus which the colonists had early tamed to ride and load with their burdens, and still more exotic pets; and steering cautiously between them came trucks and passenger vehicles which for all their crudeness of material and principle had a cleanness of design, all the taut inherent beauty of the machine, that only Imperial mechanisms matched. More significant were the people.

There was nothing marking them out as obviously different. Many physical types were in evidence here, from the tall fair islanders to the stocky arctic dwellers or the sunburned southern folk; and costumes varied accordingly, though even strangers tended to wear some form of the light local summer dress. If perhaps a tendency toward higher foreheads and more clean-cut features than the Galactic average existed, it was not striking, and there was as wide deviation from it as could be found anywhere. The

long hair of both sexes and the full beards worn by many men screened any intellectuality of appearance behind a hirsute veil associated with the peripheral barbarians.

No—the difference from any other world in the Galaxy was real and unmistakable, but it wasn't physical. It was in the clear air of the city, where all chimneys were smokeless, and in the clean-swept streets. It was in the orderliness of traffic, easy movement without jostling and confusion. It was in the clean bodies and soft voices of the people, in the casually accepted equality of the sexes even at this primitive level of technology. It was negative, in the absence of slums and jails, and positive, in the presence of parks and schools and hospitals. There were no weapons or uniforms in sight, but many in the street carried books or wore chemical-stained smocks. There were no ranting orators, but a large group sat on the grass of one park and listened to a lecture on ornithology. Laughter was quiet, but there was more of it than Heym had heard elsewhere in the Empire.

Goram muttered once: "I seem to hear quite a few languages here."

"Oh, yes," replied Heym. "Each region naturally developed its own tongue and generally sticks to it for sentimental reasons and also because the thoughts of a people are best expressed in the speech they themselves developed. But as soon as contact between the lands became common, an international language was worked out and learned by all concerned. In fact, only about fifty years ago a completely new world language was adopted, one correct according to the newly established principles of semantics. That's more than the Empire has yet done. We can talk Terrestrial safely enough, it'll pass for some local dialect, and I can do the talking for both of us with the natives."

"Still"—Goram s c o w l e d—"I don't like it. Everybody here has a higher I.Q. than myself—that's not right for a bunch of barbarians. I feel as if everyone was looking at me."

"Most of them observe us, yes, geniuses being naturally observant," said Heym. "But we aren't conspicuous in any way. Our men have often been on the planet in person without attracting attention."

"Didn't you say you'd appeared openly?"

"Yes—a few times, some centuries back, we made the most awe-inspiring possible descents, coming down through the air on gravibeams in luminous clothes and performing seeming miracles. You see, even the primitive tribes had shown no signs of organized religion beyond the usual magic rites which they soon outgrew. We wanted to see if god-worship couldn't be induced." Heym smiled wryly. "But after the generation which had actually seen us, there was no sign of our manifestation. I suppose the young, being of independent mind, simply

refused to believe their elders' wild stories. Not that the people are without religious sense. There is a high proportion of unbelievers, but there is also a large philosophical and even devotional literature. But nobody founds a school of thought, rather everybody reaches his own conclusions."

"I don't see how progress is possible then."

You wouldn't, thought Heym contemptuously, but he only smiled and said, "Apparently it is."

An aircraft roared low overhead, and a wagon driver fought to control his suddenly panicky animals. Goram said: "The biggest paradox here is the anachronism. Sailships and oilburners docked side by side, animal power in the same street with chemical engines, stone and wood houses with efficient smoke precipitators—how come?"

"It's partly a matter of the extremely rapid progress," declared Heym. "A new invention appears before the economy has become geared to it. There won't be many machines until mass-production factories are set up to produce them in quantity, and that will have to wait till mechanical knowledge is sufficiently advanced to develop factories almost entirely automatic—for few if any geniuses could stand to work on an assembly line all day. Meanwhile, the people are in no hurry to advance their standard of living. Already they have sufficient food, clothing, and other necessities for all, as well as abundant free time —why strain themselves to go beyond that? This isn't the first time a brilliantly creative civilization has existed without interest in material progress; I might cite the Hellenic phase of the ancient Classical culture on Earth as another case."

Goram, who had obviously heard nothing and cared less about Hellenic culture, was silent for a while, then at last a blurted protest: "But they're working on rockets!"

"Oh, yes—but there's a difference between exploration and exploitation. The social system here is unique, and doesn't lend itself to imperialism. The Empire doesn't have to fear Station Seventeen."

"I've told you before I'm not worried about their military power," snarled Goram.

Heym fell silent, for he felt the sudden sickening fear that the marshal might, without reason or provocation, decide to annihilate the colony—destroy it out of pure spite, pique with the psychologists and their dominion over the soldiers, vent for a gathering wrath at the subconscious, frantically denied realization of his own basic inferiority to these barbarians. If he killed them, it would be proof, the militarists' twisted proof, that he was superior after all.

With a growing desperation, Heym looked around at the people —the fortunate children of an open sky, quiet, glad, urbane, and strong with the unconquerable strength of

intelligence. Here was truly Homo sapiens, man the wise—man who had plucked fire from the mouth of a volcano, far back in the lost ages of the ice, and started on a long journey into darkness. He had come far since then, but he had ended in a blind alley. Only here, on this one insignificant world of the countless millions swarming around the stars, only here was the old quest being renewed, the path of hope being trodden. Elsewhere lay only the sorry road of empire and death. Where the path of Station Seventeen led, Heym could not imagine. Unguessably far it went, out beyond the glittering stars, his mind reeled at thought of the infinities open to mankind if he took the right turning.

The psychologist said, with desperation raw in his voice, "Goram—Marshal Goram—surely you can see the experiment is harmless. More than that, it's the most beneficial thing that has yet happened in all human history. Good Spirit, here's hope for the Empire! A race which can progress as this has done can show us the way."

"The Empire," said Goram tightly, "isn't interested in progress. It's only interested in survival."

"But—this is the way to survive. Every civilization—yes, e v e r y species—that quit advancing has become extinct."

"I'm a practical man," snapped Goram. "I'm not interested in crackpot schemes to save the universe."

"What's so practical about clinging to a system that in all history has consistently failed to work?" When the officer's face remained cold and shut, Heym said with forced persuasiveness, "After all, in physical science the planet is still centuries behind us. In fact, strangely enough, though their advance in that branch of knowledge has been as extremely rapid as you can see, they have shown a proportionately greater concentration on biological and sociological work. I don't know why, unless it is that genius is less afraid than mediocrity to study subjects which strike close to home. On Earth, astronomy, the most remote science, was the oldest, and psychiatry and sociology the youngest, but here all the sciences have got off to an even start. The mere absence of war is enough to show how far ahead of us these people are, and I could list any amount of supporting evidence. Their social system has achieved the miracle of combining progressiveness and stability. Just give the Foundation a chance to learn from them—or even, if they do work out an intersteller drive, give them a chance to teach us themselves. They're the most reasonable race in the universe—they'll be on the side of civilization, and even while overhauling it they'll be better able to preserve it than we ourselves."

"Let a bunch of barbarians take over the holy throne?" muttered Goram.

Heym closed his mouth, and a

gathering determination tightened his gaunt face. He looked around the pulsing city, and a vast tenderness and pity welled up in him—poor geniuses, poor helpless unwitting supermen—and answering it came a steely implacable resolve.

There was too much at stake to let his own personal fate matter. Certainly a mindlessly destructive atavist could not be allowed to block history. He would keep trying, he'd do his best to talk Goram over, because the alternative was fantastically risky for the station and against all his own training and principles—including elementary self-preservation.

But if he failed, if Goram remained obdurate, then he'd have to apply the same primitive methods as the soldier. Goram would have to die.

Rain clouds came out of the west with sunset, thunder rolling over the sky and a cool wet wind blowing from the sea. Goram and Heym finished a primitive but satisfying meal in a small restaurant and the psychologist said: "We'd better look for a place to stay tonight. Will you be in this city tomorrow?"

"Don't know," answered Goram curtly. He had been silent and withdrawn during the day's tour of the metropolis. "I have to think over what I've seen today. It may be enough basis for a decision, or I may want to see more of the planet."

"I'll pay the score," offered Heym. He fought to keep his voice and face blank. "And I'll ask the waiter to recommend a tavern."

He followed the man toward the kitchen. "Please," he said in the common tongue, "I wish to pay the check."

"Very well," answered the native. He was a tall young fellow with the faintly weary eyes of a scholar—probably a student, thought Heym, doing his stint here and getting his education free. He took the few coins casually.

"And—is there a place to stay overnight near here?"

"Right down the street. Stranger, I take it?"

"Yes. From Caralla on business. Oh—one other thing." It was a tremendous effort to meet that steady gaze. Heym was aware of his own clumsiness as he blurted the request: "I . . . uh . . . I've lost my knife and I need it to prepare some handicraft samples for display tomorrow. The stores are all closed now. I wonder if you have an extra one in the kitchen I could buy."

"Why—" The native paused. For a vertiginous instant, Heym thought he was going to ask questions, and he braced himself as if to meet a physical impact. But on a world where crime was virtually unknown and lying hardly ever went beyond the usual polite social fibs, even so crude a fiction could get by. "Yes, I suppose we have," said the waiter. "Here, I'll get one."

"No . . . I'll come along . . . save you the trouble . . . choose

one for my purpose if . . . uh . . . if you have several you can spare." Heym stuck close to the waiter's heels.

The kitchen was spotlessly clean, though it seemed incredible that cooking should still be done with fire. Heym chose a small sharp knife, wrapped it in a rag, and slipped it into his pocket. The waiter and chef refused his money. "Plenty where this one came from—a pleasure to help out a visitor."

"What were you out there for?" asked Goram.

Heym licked stiff lips. "The waiter was new here himself and went to ask the cook about hotels."

The first raindrops were falling as the two came out into the street. Lightning forked vividly overhead. Goram shuddered in the raw damp chill. "Foul place," he muttered. "No weather control, not even a roof for the city—uncivilized."

Heym made no reply, though he tried to unlock his jaws. The blade in his pocket seemed to have the weight of a world. He looked down from his stringy height at the soldier's squat massiveness. *I've never killed,* he thought dully. *I've never even fought, physically or mentally. I'm no match for him. It'll have to be a sneak thrust from behind.*

They entered the hotel. The clerk was reading a journal whose pages seemed purely mathematical symbols. He was probably a scientist of some kind in his main job. There was, luckily for Goram, no register to sign, the clerk merely nodded them casually toward their room.

"No system here," muttered Goram. "How can they keep track of anybody without registry?"

"They don't," said Heym. "And they don't have to."

The room was large and airy and well furnished. "I've slept in worse places," said the soldier grudgingly. He flopped into a chair. "But it's the first place where the hired help reads technical journals that I've seen."

"The social order here is unique," Heym repeated himself. "The colonists evolved through families, clans, tribes, kingdoms, and republics in a matter of centuries. Finally the most advanced countries worked out the present system, which was universally adopted when planetary government was established."

"What is it?"

"Well, it's a kind of democratic socialism—really the only logical form of government for a race of geniuses, at least until robots are developed. You see, the race needs an advanced civilization, with its technical advantages, in order to give the brilliant minds contact with each other and resources to carry out and propagate their ideas. Yet no high-grade mind should be put to the myriad routine and menial tasks essential to running a civilization, everything from garbage collection to government. The present set-up is a compromise, in which everyone

puts in a small proportion of his time at those jobs. He can do manual work, or teach, or run a public-service enterprise like a farm or restaurant—whatever he wishes. And he can work steadily at it for a few years and then have all his needs taken care of for the rest of his life, or else put in a few hours a day, two or three, over a longer period of time. The result is that needs and a social surplus are available for all, as well as education, health services, entertainment, or whatever else is considered desirable. The planet could, in fact, do without money, but it's more convenient to pay in cash than fill out credit slips.

"Incidentally, that's probably one reason there's no great interest in providing more material goods for all—it would mean that everyone would have to put in more time in the mines and factories and less on his chosen work. Which is apparently a price that genius is unwilling to pay. I don't think there'll be any great progress in applied science until the research project established some time back perfects the robots it's set for a goal."

"Uh-huh," muttered Goram. "And just let them expand into the Galaxy and find we have such robots—left unproduced since the Imperial populace has to be kept busy—and see what they'll do. They'd be able to wreck the whole set-up, just by inventing and distributing, and they'll know it."

"Can't you credit them with being smart enough to see the reasons for maintaining the status quo?" asked Heym desperately. "They don't want the barbarians on their necks any more than we do. They'll help us maintain the Empire until they have developed a way to change conditions safely."

"Maybe." Goram's mouth was tight. "Still, they'll hold the balance of power. which is something no group except the Imperium can be permitted to do. Spirit! How do you even know they'll be on our side? They may decide their best advantage lies with our rivals. Or they may be irritated with our having used them so cavalierly all these centuries."

"They won't hold grudges," said Heym. "A genius doesn't."

"How do you know?" Goram sprang out of his chair and paced the floor. His voice rose almost to a shout. "You've said all along that the genius is naturally peaceful and tolerant and unselfish and every other of the milk-and-water virtues. Yet, your own history is against you all the way. Every great military leader has been a genius. There've been sadistic geniuses, and bigoted geniuses, and criminal geniuses—yes, insane geniuses! Why, every one of the hundred billion or so important men in the Imperial government is a genius—on our side—and more than half the barbarian chiefs are known to have genius intellect." He swung a red and twisted face on the psychologist. "How do you know this is a planet of saints? Answer me that!"

Thunder roared in the fulgurous sky, rolling and booming between the rain-running streets. The single dim electric bulb in the room flickered. Wind whined around the corners of the building.

Heym took out a cigarette pack with fingers that shook. He held it out to Goram, who shook his heavy bullet head in angry refusal. The psychologist took time to bring one of the cylinders into his mouth and puff it into lighting. He drew smoke deeply into his lungs, fighting for steadiness.

It was his last real chance to convince Goram. If this failed, he'd just have to try to murder the soldier. If that attempt miscarried—oh, Spirit, then Station Seventeen and the Empire were doomed. But if he succeeded, well, he might be able to convince the Imperial police that it had been an accident, a runaway animal or something of the sort, or they might send him to the disintegration chamber for murder. In any case, there would be a faint hope that the next inspector would be a reasonable man.

He said slowly: "To explain the theory of historical progress, I'd have to give you a fairly long lecture."

Goram sprawled back into his chair, crude and strong and arrogant. His little black eyes were drills, boring into the psychologist's soul. "I'm listening," he snapped.

"Well"—Heym walked up and down the floor, hands clasped behind his back—"it's evident from a study of history that all progress is due to gifted individuals. Always, in every field, the talented or otherwise fortunate few have led and the mass has dumbly followed. A republic is the only form of state which even pretends to offer self-government, and as soon as the population becomes any size at all the people are again led by the nose, their rulers struggling for power with money and such means of mass hypnotism as news services and other propaganda machines. And all republics become dictatorships, in fact if not in name, within a few centuries at most. As for art and science and religion and the other creative fields, it is still more obviously the few who lead.

"The ordinary man is just plain stupid. Perhaps proper mind training could lift him above himself, but it's never been tried. Meanwhile he remains immensely conservative, only occasional outbreaks of mindless hysteria engineered by some special group stirring him out of his routine. He follows, or rather he accepts what the creative or dominant minority does, but it is haltingly and unwillingly.

"Yet it is society as a whole which *does*. History is a mass action process. Gifted individuals start it off, but it is the huge mass of the social group which actually accomplishes the process. A new invention or a new land to colonize or a new philosophy or any other innovation would have no significance unless everybody eventually adopted

or exploited or otherwise made use of it. And society as a whole is conservative, or perhaps I should say preservative. Civilization is ninety-nine percent habit, the use of past discoveries or the influence of past events. Against the immense conservatism of mankind in the mass, and in comparison to the tremendous accumulation of past accomplishment, the achievement of the individual genius or the small group is almost insignificant. It is not surprising that progress is slow and irregular and liable to stagnation or violent setbacks. The surprising thing is really that any event of significance can happen at all."

Heym paused. Thunder snarled in the sky and the rain drummed on the windowpane with cold restless fingers. Goram stirred impatiently. "What are you leading up to?" he muttered.

"Simply this." Heym's hand fell into his pocket and closed on the smooth hard handle of the knife. Goram slumped in his chair, head lowered, staring sullenly at the floor. If the blade were driven in now,

right into that bull neck, a paralyzing blow and then a swift slash across the jugular—

The intensity of the hatred welling up in him shocked Heym. He should be above the brutal level of his enemy. Yet—to see his blood spurt!

Steady—steady— That move of desperation might not be necessary.

"Two factors control the individual in society," said Heym, and the detached calm of his voice was vaguely surprising to him. "They are only arbitrarily separable, being aspects of the same thing, but it's convenient to take them up in turn.

"There is first the simple weight of social pressure. We all want to be approved by our fellows, within reasonable limits at least. The mores of the society, whatever they may be, are those of the individual. Only a psychopath would disregard them completely. Not only does society apply force on the nonconformist, but mere disapproval can be devastating. It takes a really brave—and somewhat neurotic—individual to be different in any important respect. Many have paid with their lives for innovating. So a genius will be hampered in making original contributions, and they are adopted only slowly. It usually takes a new idea many generations to become accepted. The astonishing rate of growth of science, back in the days when free research was permitted and even encouraged, indicates how rapid progress can be when there are no barriers.

"And, of course, this social pressure usually forces conformity even on reluctant individuals. A scientist may be naturally peaceful, for instance, but he will hardly ever refuse to engage in war research when so directed.

"The second hold of the mass on the individual is subtler and more effective. It is the mental conditioning induced by growing up in a society where certain conditions of living and rules of thought are accepted. A 'born' pacifist, growing up in a warlike culture, will generally accept war as part of the natural order of things. A man who might have been a complete skeptic in a science-based society will nearly always accept the gods of a theocracy if he has been brought up to believe in them. He may even become a priest and direct his logical talents toward elaborating the accepted theology—and help in the persecution of unbelievers. And so on. I needn't go into detail. The power of social conditioning is unbelievable—combined with social pressure, it is almost insuperable.

"And—this is the important point—the rules and assumptions of a society are accepted and enforced by the mass—the overwhelming majority, shortsighted, conservative, hating and fearing all that is new and strange, wishing only to remain in whatever basic condition it has known from birth. The genius is forced into the straight-jacket of the mediocre man's and the moron's mentality. That he can expand any

distance at all beyond his prison is a tribute to the supreme power of the high intellect."

Heym looked out at the empty street. Rain blew wildly across its darkened surface. Lightning glared blindingly, almost in his eyes. His voice rose over the shattering thunder: "The Solarian Empire is nothing but the triumph of stupidity over intelligence. If every man could think for himself, we wouldn't need an empire."

"Watch yourself," muttered Goram. "The ruling class has a certain latitude of speech, but don't overstep it." And more loudly: "What does this mean in the case of Station Seventeen?"

"Why, it's a triumphant confirmation of the historical theory I was just explaining," said Heym. "We've isolated pure genius from mediocrity and left it free to work out its own destiny. The result has even exceeded our predictions.

"Most of man's history has been spent in the stone ages, because the savage is even more superstitious and conservative than the civilized man, whose culture does have a certain momentum. But the people of this planet had invented metallurgy and writing within a thousand years of the colony's establishment. The essential difference was that there was progress made each generation, rather than every hundred or thousand generations. Every mind is creative, and every individual is willing to accept the ideas and work of every other.

"No doubt there are aggressive and conservative and selfish people born. But on this world the weight of social conditioning and social pressure is away from those tendencies, they don't get a chance to develop themselves.

"Man's brain is physically not qualitatively different from that of the other higher mammals. It has no feature not found in the brain of an ape, say. But the quantitative difference, in the relatively immense forebrain, leads to a qualitative difference of mental *type*. Man is sharply differentiated from the other animals by the power to make indefinite orders of abstraction. Hence progress is possible for him.

"It seems"—Heym's voice rose over the whistle of wind—"that genius shows a similar qualitative distinction, due to quantitative difference, from mere human intelligence. The genius is basically a distinct type, just as the moron is on the other end of the scale. And here—on Seventeen—the new type has been set free."

He turned around from the window. The voice of the storm seemed remote, lost in the tremendous silence that suddenly filled the room. Goram sat motionless, staring at the floor, and the slow seconds ticked away before he spoke.

"I don't know—" he murmured. "I don't know—"

Defeat and despair and a binding hatred rose into Heym's throat, tasting of vomit. *You don't know!* His mind screamed the thought, it

seemed incredible that Goram should sprawl there, not moving, not hearing. *No, you don't know. Your sort never does, never has known anything but its own witless bestial desires, its own self-righteous rationalization of impulses that should have died with Smilodon. You'll destroy Seventeen, in spite of all reason, in sheer perversity—and you'll say you did it for the good of the Empire!*

The knife seemed to spring of its own accord into his hand. He was lunging forward before he realized it. He saw the blade gleam down as if another man were wielding it. The blow shocked back into his muscles and for an instant his mind wavered, it wasn't real—*what am I doing?*

No time to lose. Goram twisted around in his seat, yelling, grabbing for Heym. The knife was deep in his neck. Heym yanked at it—pull it loose, stick it in the throat, kill—

Something struck him from behind. The world shattered in a burst of stars, he crashed to the floor and rolled over. Through a haze of dizzy pain he saw men bending over Goram—men of the planet, rescuers for the monster who would annihilate them.

Words tumbled from the hotel clerk, anxious, shaken: "Are you hurt? Did you— Still, lie still, here comes a doctor—"

Pain curled Goram's lips back from his teeth, but he muttered reply: "No . . . I'm all right . . . flesh wound—"

The doctor bent over his bloody form. "Deep," he said, "but it missed the important veins. Here, I'll just pull it out—"

"Go ahead," whispered Goram. "I've taken worse than this, though . . . I never expected it here."

Heym lay on the floor while they worked over the soldier. His ringing, whirling head throbbed toward steadiness, and slowly, with so tremendous an impact that it overloaded his nerves and entered his consciousness without emotional shock, the realization grew.

Goram had spoken to the natives —in their own language.

A man bent over the psychologist. "Are you all right?" he asked. "I'm sorry I had to hit you so hard. Here —drink this."

Heym forced the liquid down his throat. It coursed fierily through his veins, he sat up with an arm supporting him about his waist and held his head in his hands.

Someone else spoke, the voice seemed to come from across an abyss: "Did he hear?"

"I'm afraid so." Goram, his neck bandaged, spoke painfully. A rueful smile crossed his ugly face. "The excitement was too much for me, or I would have kept silent. This is going to be—inconvenient."

The men of the planet helped Heym into a chair. He began to revive, and looked dazedly across at the man he had tried to kill. The others stood around the chairs, tall

bearded men in barbaric dress, watching him with alertness and a strange pity.

"Yes," said Tamman Goram very quietly, "the assistant Grand Marshal of the Solarian Empire is a native of Station Seventeen."

"Who else?" whispered Heym. "How and why? I tried to kill you because I thought you meant to order the planet sterilized."

"It was an act," said Goram. "I meant to concede at last that the station was harmless and could be safely left to the Foundation's observers. Coming from one who had apparently been strongly inclined to the opposite view, the statement would have been doubly convincing to Imperial officialdom. It was a powerful and suspicious minister who ordered the investigation, and I went to soothe his feelings. His successor will be one of our men, who will see that Station Seventeen drops into safe obscurity as an unimportant and generally unsuccessful experiment conducted by a few harmless cranks."

"But . . . aren't you . . . weren't you—"

"Oh, yes. My history is perfectly genuine. I was planted as an obscure recruit in the border guards many years ago, and since then my rise has been strictly in accord with Imperial principles. All our men in the Empire will bear the most searching investigation. Sometimes they come from families which have lived several generations on Imperial planets. Our program of replacing key personnel with our men is planned centuries ahead of time, and succeeds by the simple fact that on the average, over long periods of time, they are so much more capable than anyone else."

"How long—?"

"About five hundred years. You underestimated the capabilities of your experimental animals." Goram rested for a moment, then asked, "If human intelligence is qualitatively different from animal intelligence, and genius is different from ordinary reasoning power—then tell me, what about the equivalent of geniuses in a world where the average man is a genius by the usual standards?"

"Pure genius strains kept right on evolving, more rapidly indeed than can be explained on any other basis than the existence of an orthogenetic factor in evolution. Supergenius—give it a different name, call it transcendence, since it is a different quality—has capabilities which the ordinary mind can no more than comprehend than pure instinct can comprehend logic.

"Your spectacular god-revelations were not forgotten, they were treated discreetly. Later, when a theory of evolution was developed, it seemed strange that man, though obviously an animal, should have no apparent phylogenesis. The stories of the 'gods,' the theories of evolution and astronomy—we began to suspect the truth. With that suspicion, it was not hard for a transcendent to spot your masquerad-

ing psychologists. Kidnaping, questioning under drugs developed by psychiatry, and release of the prisoner with memory of his experience removed told us the rest. Later, disguised as other prisoners, with their knowledge, and his own intelligence to fill the gaps, one transcendent after another made his way to the observation asteroid—thence out into the Galaxy, where a little spying was sufficient to reveal the principles of the interstellar drive and the other mechanisms of the Empire."

Heym murmured: "The whole planet has been—acting?"

"Yes." Goram chuckled. "Rather fun for all concerned. You'd be surprised at the installations we have, out of spy-machine range. As soon as they are old enough to carry out the deception, our children are told the truth. It has actually made little difference to our lives except for those few million who are out in the Galaxy taking it over."

"Taking . . . it . . . over?" Heym's mind seemed to be turning over slowly, infinitely slowly and wearily.

"Of course." A strange blend of sternness and sympathy overlay Goram's harsh features. "One planet obviously cannot fight the Galaxy, nor do we wish to. Yet we cannot permit it to menace us. The only answer is—annexation."

"And . . . then?"

"I'm sorry." Goram's voice came slowly, implacably, "but I'm afraid you overrated the good intentions of the pure genius strain. After all, Homo intelligens can no more be expected to serve Homo sapiens than early man to serve the apes.

"We're taking over barbarians and Empire alike. After that, the Galaxy will do as *we* wish. Oh, we won't be hard masters. Man may never know that he is being ruled from outside, and he will enter a period of peace and contentment such as he has never imagined.

"As for you—"

Heym realized with vague shock that he had not even wondered or cared what was to become of him personally.

"You are sympathetic to us—but your loyalty is to the Empire. You have thought of us only in relation to our usefulness to the Imperium. Perhaps we could trust you to keep our secret, perhaps not. We can't take the risk. You might even release the truth inadvertently. Nor can we erase your memory of this—it would leave traces that an expert psychiatrist could detect, and all high officials undergo regular psychoanalytic checkups.

"I'll just have to report you as accidentally killed on the planet." Goram smiled. "I don't think you'll find life exile on this world, out of sight of the observers, uncongenial. And we might as well see about making your successor one of our men. It was about ready for that."

He added thoughtfully: "In fact, the Galaxy may be ready for a new Solarian Emperor."

THE END

LATE NIGHT FINAL

BY ERIC FRANK RUSSELL

***The** first ships that landed on Earth were just the first reaching fingers of the hard, strong arm of the military dictatorship. The first of the conquerors. A glass-hard crew—*

Illustrated by Orban

Commander Cruin went down the extending metal ladder, paused a rung from the bottom, placed one important foot on the new territory, and then the other. That made him the first of his kind on an unknown world.

He posed there in the sunlight, a big bull of a man meticulously attired for the occasion. Not a spot

marred his faultlessly cut uniform of gray-green on which jeweled orders of merit sparkled and flashed. His jack boots glistened as they had never done since the day of launching from the home planet. The golden bells of his rank tinkled on his heel-hooks as he shifted his feet slightly. In the deep shadow beneath the visor of his ornate helmet his hard eyes held a glow of self-satisfaction.

A microphone came swinging down to him from the air lock he'd just left. Taking it in a huge left hand, he looked straight ahead with the blank intentness of one who sees long visions of the past and longer visions of the future. Indeed, this was as visionary a moment as any there had been in his world's history.

"In the name of Huld and the people of Huld," he enunciated officiously, "I take this planet." Then he saluted swiftly, slickly, like an automaton.

Facing him, twenty-two long, black spaceships simultaneously thrust from their forward ports their glorypoles ringed with the red-black-gold colors of Huld. Inside the vessels twenty-two crews of seventy men apiece stood rigidly erect, saluted, broke into well-drilled song, "Oh, heavenly fatherland of Huld."

When they had finished, Commander Cruin saluted again. The crews repeated their salute. The glorypoles were drawn in. Cruin mounted the ladder, entered his flagship. All locks were closed. Along the valley the twenty-two invaders lay in military formation, spaced equidistantly, noses and tails dead in line.

On a low hill a mile to the east a fire sent up a column of thick smoke. It spat and blazed amid the remnants of what had been the twenty-third vessel—and the eighth successive loss since the fleet had set forth three years ago. Thirty then. Twenty-two now.

The price of empire.

Reaching his cabin, Commander Cruin lowered his bulk into the seat behind his desk, took off his heavy helmet, adjusted an order of merit which was hiding modestly behind its neighbor.

"Step four," he commented with satisfaction.

Second Commander Jusik nodded respectfully. He handed the other a book. Opening it, Cruin meditated aloud.

"Step one: Check planet's certain suitability for our form of life." He rubbed his big jowls. "We know it's suitable."

"Yes, sir. This is a great triumph for you."

"Thank you, Jusik." A craggy smile played momentarily on one side of Cruin's broad face. "Step two: Remain in planetary shadow at distance of not less than one diameter while scout boats survey world for evidence of superior life forms. Three: Select landing place far from largest sources of

possible resistance but adjacent to a source small enough to be mastered. Four: Declare Huld's claim ceremoniously, as prescribed in manual on procedure and discipline." He worked his jowls again. "We've done all that."

The smile returned, and he glanced with satisfaction out of the small port near his chair. The port framed the smoke column on the hill. His expression changed to a scowl, and his jaw muscles lumped.

"Fully trained and completely qualified," he growled sardonically. "Yet he had to smash up. Another ship and crew lost in the very moment we reach our goal. The eighth such loss. There will be a purge in the astronautical training center when I return."

"Yes, sir," approved Jusik, dutifully. "There is no excuse for it."

"There are no excuses for anything," Cruin retorted.

"No, sir."

Snorting his contempt, Cruin looked at his book. "Step five: Make all protective preparations as detailed in defense manual." He glanced up into Jusik's lean, clear-cut features. "Every captain has been issued with a defense manual. Are they carrying out its orders?"

"Yes, sir. They have started already."

"They better had! I shall arrange a demotion of the slowest." Wetting a large thumb, he flipped a page over. "Step six: If planet does hold life forms of suspected intelligence, obtain specimens."

Lying back in his seat he mused a moment, then barked: "Well, for what are you waiting?"

"I beg your pardon, sir?"

"Get some examples," roared Cruin.

"Very well, sir." Without blinking, Jusik saluted, marched out.

The self-closer swung the door behind him. Cruin surveyed it with a jaundiced eye.

"Curse the training center," he rumbled. "It has deteriorated since I was there."

Putting his feet on the desk, he waggled his heels to make the bells tinkle while he waited for the examples.

Three specimens turned up of their own accord. They were seen standing wide-eyed in a row near the prow of number twenty-two, the endmost ship of the line. Captain Somir brought them along personally.

"Step six calls for specimens, sir," he explained to Commander Cruin. "I know that you require ones better than these, but I found these under our nose."

"Under your nose? You land and within short time other life forms are sightseeing around your vessel? What about your protective precautions?"

"They are not completed yet, sir. They take some time."

"What were your lookouts doing—sleeping?"

"No, sir," assured Somir desperately. "They did not think it

necessary to sound a general alarm for such as these."

Reluctantly, Cruin granted the point. His gaze ran contemptuously over the trio. Three kids. One was a boy, knee-high, snub-nosed, chewing at a chubby fist. The next, a skinny-legged, pigtailed girl obviously older than the boy. The third was another girl almost as tall as Somir, somewhat skinny, but with a hint of coming shapeliness hiding in her thin attire. All three were freckled, all had violently red hair.

The tall girl said to Cruin: "I'm Marva—Marva Meredith." She indicated her companions. "This is Sue and this is Sam. We live over there, in Williamsville." She smiled at him and suddenly he noticed that her eyes were a rich and startling green. "We were looking for blueberries when we saw you come down."

Cruin grunted, rested his hands on his paunch. The fact that this planet's life manifestly was of his own shape and form impressed him not at all. It had never occurred to him that it could have proved otherwise. In Huldian thought, all superior life must be humanoid and no exploration had yet provided evidence to the contrary.

"I don't understand her alien gabble and she doesn't understand Huldian," he complained to Somir. "She must be dull-witted to waste her breath thus."

"Yes, sir," agreed Somir. "Do you wish me to hand them over to the tutors?"

"No. They're not worth it." He eyed the small boy's freckles with distaste, never having seen such a phenomenon before. "They are badly spotted and may be diseased. *Pfaugh!*" He grimaced with disgust. "Did they pass through the ray-sterilizing chamber as they came in?"

"Certainly, sir. I was most careful about that."

"Be equally careful about any more you may encounter." Slowly, his authoritative stare went from the boy to the pigtailed girl and finally to the tall one. He didn't want to look at her, yet knew that he was going to. Her cool green eyes held something that made him vaguely uncomfortable. Unwillingly he met those eyes. She smiled again, with little dimples. "Kick 'em out!" he rapped at Somir.

"As you order, sir."

Nudging them, Somir gestured toward the door. The three took hold of each other's hands, filed out.

"Bye!" chirped the boy, solemnly.

"Bye!" said pigtails, shyly.

The tall girl turned in the doorway. "Good-by!"

Gazing at her uncomprehendingly, Cruin fidgeted in his chair. She dimpled at him, then the door swung to.

"Good-by." He mouthed the strange word to himself. Considering the circumstances in which it had been uttered, evidently it meant

farewell. Already he had picked up one word of their language.

"Step seven: Gain communication by tutoring specimens until they are proficient in Huldian."

Teach them. Do not let them teach you—teach *them*. The slaves must learn from the masters, not the masters from the slaves.

"Good-by." He repeated it with savage self-accusation. A minor matter, but still an infringement of the book of rules. There are no excuses for anything.

Teach them.

The slaves—

Rockets rumbled and blasted deafeningly as ships maneuvered themselves into the positions laid down in the manual of defense. Several hours of careful belly-edging were required for this. In the end, the line had reshaped itself into two groups of eleven-pointed stars, noses at the centers, tails outward. Ash of blast-destroyed grasses, shrubs and trees covered a wide area beyond the two menacing rings of main propulsion tubes which could incinerate anything within one mile.

This done, perspiring, dirt-coated crews lugged out their forward armaments, remounted them pointing outward in the spaces between the vessels' splayed tails. Rear armaments still aboard already were directed upward and outward. Armaments plus tubes now provided a formidable field of fire completely surrounding the double encampment. It was the Huldian master plan conceived by Huldian master planners. In other more alien estimation, it was the old covered-wagon technique, so incredibly ancient that it had been forgotten by all but most earnest students of the past. But none of the invaders knew that.

Around the perimeter they stacked the small, fast, well-armed scouts of which there were two per ship. Noses outward, tails inward, in readiness for quick take-off, they were paired just beyond the parent vessels, below the propulsion tubes, and out of line of the remounted batteries. There was a lot of moving around to get the scouts positioned at precisely the same distances apart and making precisely the same angles. The whole arrangement had that geometrical exactness beloved of the military mind.

Pacing the narrow catwalk running along the top surface of his flagship, Commander Cruin observed his toiling crews with satisfaction. Organization, discipline, energy, unquestioning obedience—those were the prime essentials of efficiency. On such had Huld grown great. On such would Huld grow greater.

Reaching the tail-end, he leaned on the stop-rail, gazed down upon the concentric rings of wide, stubby venturis. His own crew were checking the angles of their two scouts already positioned. Four guards, heavily armed, came marching through the ash with Jusik in the

lead. They had six prisoners.

Seeing him, Jusik bawled: "Halt!" Guard and guarded stopped with a thud of boots and a rise of dust. Looking up, Jusik saluted.

"Six specimens, sir."

Cruin eyed them indifferently. Half a dozen middle-aged men in drab, sloppily fitting clothes. He would not have given a snap of the fingers for six thousand of them.

The biggest of the captives, the one second from the left, had red hair and was sucking something that gave off smoke. His shoulders were wider than Cruin's own though he didn't look half the weight. Idly, the commander wondered whether the fellow had green eyes; he couldn't tell that from where he was standing.

Calmly surveying Cruin, this prisoner took the smoke-thing from his mouth and said, tonelessly: "By hokey, a brasshat!" Then he shoved the thing back between his lips and dribbled blue vapor.

The others looked doubtful, as if either they did not comprehend or found it past belief.

"Jeepers, *no!*" said the one on the right, a gaunt individual with thin, saturnine features.

"I'm telling you," assured Redhead in the same flat voice.

"Shall I take them to the tutors, sir?" asked Jusik.

"Yes." Unleaning from the rail, Cruin carefully adjusted his white gloves. "Don't bother me with them again until they are certified as competent to talk." Answering the other's salute, he paraded back along the catwalk.

"See?" said Redhead, picking up his feet in time with the guard. He seemed to take an obscure pleasure in keeping in step with the guard. Winking at the nearest prisoner, he let a curl of aromatic smoke trickle from the side of his mouth.

Tutors Fane and Parth sought an interview the following evening. Jusik ushered them in, and Cruin looked up irritably from the report he was writing.

"Well?"

Fane said: "Sir, these prisoners suggest that we share their homes for a while and teach them to converse there."

"How did they suggest that?"

"Mostly by signs," explained Fane.

"And what made you think that so nonsensical a plan had sufficient merit to make it worthy of my attention?"

"There are aspects about which you should be consulted," Fane continued stubbornly. "The manual of procedure and discipline declares that such matters must be placed before the commanding officer whose decision is final.".

"Quite right, quite right." He regarded Fane with a little more favor. "What are these matters?"

"Time is important to us, and the quicker these prisoners learn our language the better it will be. Here, their minds are occupied by their predicament. They think too

much of their friends and families. In their own homes it would be different, and they could learn at great speed."

"A weak pretext," scoffed Cruin.

"That is not all. By nature they are naive and friendly. I feel that we have little to fear from them. Had they been hostile they would have attacked by now."

"Not necessarily. It is wise to be cautious. The manual of defense emphasizes that fact repeatedly. These creatures may wish first to gain the measure of us before they try to deal with us."

Fane was prompt to snatch the opportunity. "Your point, sir, is also my final one. Here, they are six pairs of eyes and six pairs of ears in the middle of us, and their absence is likely to give cause for alarm in their home town. Were they there, complacency would replace that alarm—and *we* would be the eyes and ears!"

"Well put," commented Jusik, momentarily forgetting himself.

"Be silent!" Cruin glared at him. "I do not recall any ruling in the manual pertaining to such a suggestion as this. Let me check up." Grabbing his books, he sought through them. He took a long time about it, gave up, and said: "The only pertinent rule appears to be that in circumstances not specified in the manual the decision is wholly mine, to be made in light of said circumstances providing that they do not conflict with the rulings of any other manual which may be applicable to the situation, and providing that my decision does not effectively countermand that or those of any senior ranking officer whose authority extends to the same area." He took a deep breath.

"Yes, sir," said Fane.

"Quite, sir," said Parth.

Cruin frowned heavily. "How far away are these prisoners' homes?"

"One hour's walk." Fane made a persuasive gesture. "If anything did happen to us—which I consider extremely unlikely—one scout could wipe out their little town before they'd time to realize what had happened. One scout, one bomb, one minute!" Dexterously, he added, "At your order, sir."

Cruin preened himself visibly. "I see no reason why we should not take advantage of their stupidity." His eyes asked Jusik what he thought, but that person failed to notice. "Since you two tutors have brought this plan to me, I hereby approve it, and I appoint you to carry it through." He consulted a list which he extracted from a drawer. "Take two psychologists with you—Kalma and Hefni."

"Very well, sir." Impassively, Fane saluted and went out, Parth following.

Staring absently at his half-written report, Cruin fiddled with his pen for a while, glanced up at Jusik, and spat: "At what are you smiling?"

Jusik wiped it from his face, looked solemn.

"Come on. Out with it!"

"I was thinking, sir," replied Jusik, slowly, "that three years in a ship is a very long time."

Slamming his pen on the desk, Cruin stood up. "Has it been any longer for others than for me?"

"For you," said Jusik, daringly but respectfully, "I think it has been longest of all."

"Get out!" shouted Cruin.

He watched the other go, watched the self-closer push the door, waited for its last click. He shifted his gaze to the port, stared hard-eyed into the gathering dusk. His heel-bells were silent as he stood unmoving and saw the invisible sun sucking its last rays from the sky.

In short time, ten figures strolled through the twilight toward the distant, tree-topped hill. Four were uniformed; six in drab, shapeless clothes. They went by conversing with many gestures, and one of them laughed. He gnawed his bottom lip as his gaze followed them until they were gone.

The price of rank.

"Step eight: Repel initial attacks in accordance with techniques detailed in manual of defense." Cruin snorted, put up one hand, tidied his orders of merit.

"There have been no attacks," said Jusik.

"I am not unaware of the fact." The commander glowered at him. "I'd have preferred an onslaught. We are ready for them. The sooner they match their strength against ours the sooner they'll learn who's boss now!" He hooked big thumbs in his silver-braided belt. "And besides, it would give the men something to do. I cannot have them everlastingly repeating their drills of procedure. We've been here nine days and nothing has happened." His attention returned to the book. "Step nine: Follow defeat of initial attacks by taking aggressive action as detailed in manual of defense." He gave another snort. "How can one follow something that has not occurred?"

"It is impossible," Jusik ventured.

"Nothing is impossible," Cruin contradicted, harshly. "Step ten: In the unlikely event that intelligent life displays indifference or amity, remain in protective formation while specimens are being tutored, meanwhile employing scout vessels to survey surrounding area to the limit of their flight-duration, using no more than one-fifth of the numbers available at any time."

"That allows us eight or nine scouts on survey," observed Jusik,

thoughtfully. "What is our authorized step if they fail to return?"

"Why d'you ask that?"

"Those eight scouts I sent out on your orders forty periods ago are overdue."

Viciously, Commander Cruin thrust away his book. His broad, heavy face was dark red.

"Second Commander Jusik, it was your duty to report this fact to me the moment those vessels became overdue."

"Which I have," said Jusik, imperturbably. "They have a flight-duration of forty periods, as you know. That, sir, made them due a short time ago. They are now late."

Cruin tramped twice across the room, medals clinking, heel-bells jangling. "The answer to nonappearance is immediately to obliterate the areas in which they are held. No half-measures. A salutary lesson."

"Which areas, sir?"

Stopping in mid-stride, Cruin bawled: "*You* ought to know that. Those scouts had properly formulated route orders, didn't they? It's a simple matter to—"

He ceased as a shrill whine passed overhead, lowered to a dull moan in the distance, curved back on a rising note again.

"Number one." Jusik looked at the little timemeter on the wall. "Late, but here. Maybe the others will turn up now."

"Somebody's going to get a sharp lesson if they don't!"

"I'll see what he has to report." Saluting, Jusik hurried through the doorway.

Gazing out of his port, Cruin observed the delinquent scout belly-sliding up to the nearest formation. He chewed steadily at his bottom lip, a slow, persistent chew which showed his thoughts to be wandering around in labyrinths of their own.

Beyond the fringe of dank, dead ash were golden buttercups in the grasses, and a hum of bees, and the gentle rustle of leaves on trees. Four engine-room wranglers of ship number seventeen had found this sanctuary and sprawled flat on their backs in the shade of a big-leafed and blossom-ornamented growth. With eyes closed, their hands plucked idly at surrounding grasses while they maintained a lazy, desultory conversation through which they failed to hear the ring of Cruin's approaching bells.

Standing before them, his complexion florid, he roared: "Get up!"

Shooting to their feet, they stood stiffly shoulder to shoulder, faces expressionless, eyes level, hands at their sides.

"Your names?" He wrote them in his notebook while obediently they repeated them in precise, unemotional voices. "I'll deal with you later," he promised. "March!"

Together, they saluted, marched off with a rhythmic pounding of boots, one-two-three-hup! His angry stare followed them until they

reached the shadow of their ship. Not until then did he turn and proceed. Mounting the hill, one cautious hand continually on the cold butt of his gun, he reached the crest, gazed down into the valley he'd just left. In neat, exact positioning, the two star-formations of the ships of Huld were silent and ominous.

His hard, authoritative eyes turned to the other side of the hill. There, the landscape was pastoral. A wooded slope ran down to a little river which meandered into the hazy distance, and on its farther side was a broad patchwork of cultivated fields in which three houses were visible.

Seating himself on a large rock, Cruin loosened his gun in its holster, took a wary look around, extracted a small wad of reports from his pocket and glanced over them for the twentieth time. A faint smell of herbs and resin came to his nostrils as he read.

"I circled this landing place at low altitude and recorded it photographically, taking care to include all the machines standing thereon. Two other machines which were in the air went on their way without attempting to interfere. It then occurred to me that the signals they were making from the ground might be an invitation to land, and I decided to utilize opportunism as recommended in the manual of procedure. Therefore I landed. They conducted my scout vessel to a dispersal point off the runway and made me welcome."

Something fluted liquidly in a nearby tree. Cruin looked up, his hand automatically seeking his holster. It was only a bird. Skipping parts of the report, he frowned over the concluding words.

". . . lack of common speech made it difficult for me to refuse, and after the sixth drink during my tour of the town I was suddenly afflicted with a strange paralysis in the legs and collapsed into the arms of my companions. Believing that they had poisoned me by guile, I prepared for death . . . tickled my throat while making jocular remarks . . . I was a little sick." Cruin rubbed his chin in puzzlement. "Not until they were satisfied about my recovery did they take me back to my vessel. They waved their hands at me as I took off. I apologize to my captain for overdue return and plead that it was because of factors beyond my control."

The fluter came down to Cruin's feet, piped at him plaintively. It cocked its head sidewise as it examined him with bright, beady eyes.

Shifting the sheet he'd been reading, he scanned the next one. It was neatly typewritten, and signed jointly by Parth, Fane, Kalma and Hefni.

"Do not appear fully to appreciate what has occurred . . . seem to view the arrival of a Huldian fleet as just another incident. They have a remarkable self-assurance which is incomprehensible inasmuch

as we can find nothing to justify such an attitude. Mastery of them should be so easy that if our homing vessel does not leave too soon it should be possible for it to bear tidings of conquest as well as of mere discovery."

"Conquest," he murmured. It had a mighty imposing sound. A word like that would send a tremendous thrill of excitement throughout the entire world of Huld.

Five before him had sent back ships telling of discovery, but none had gone so far as he, none had traveled so long and wearily, none had been rewarded with a planet so big, lush, desirable—and none had reported the subjection of their finds. One cannot conquer a rocky waste. But this—

In peculiarly accented Huldian, a voice behind him said, brightly: "Good morning!"

He came up fast, his hand sliding to his side, his face hard with authority.

She was laughing at him with her clear green eyes. "Remember me—Marva Meredith?" Her flaming hair was windblown. "You see," she went on, in slow, awkward tones, "I know a little Huldian already. Just a few words."

"Who taught you?" he asked, bluntly.

"Fane and Parth."

"It is your house to which they have gone?"

"Oh, yes. Kalma and Hefni are guesting with Bill Gleeson; Fane and Parth with us. Father brought them to us. They share the welcome room."

"Welcome room?"

"Of course." Perching herself on his rock, she drew up her slender legs, rested her chin on her knees. He noticed that the legs, like her face, were freckled. "Of course. Everyone has a welcome room, haven't they?"

Cruin said nothing.

"Haven't you a welcome room in your home?"

"Home?" His eyes strayed away from hers, sought the fluting bird. It wasn't there. Somehow, his hand had left his holster without realizing it. He was holding his hands together, each nursing the other, clinging, finding company, soothing each other.

Her gaze was on his hands as she said, softly and hesitantly, "You have got a home . . . somewhere . . . haven't you?"

"No."

Lowering her legs, she stood up. "I'm so sorry."

"*You* are sorry for *me?*" His gaze switched back to her. It held incredulity, amazement, a mite of anger. His voice was harsh. "You must be singularly stupid."

"Am I?" she asked, humbly.

"No member of my expedition has a home," he went on. "Every man was carefully selected. Every man passed through a screen, suffered the most exacting tests. Intelligence and technical competence

were not enough; each had also to be young, healthy, without ties of any sort. They were chosen for ability to concentrate on the task in hand without indulging morale-lowering sentimentalities about people left behind."

"I don't understand some of your long words," she complained. "And you are speaking far too fast."

He repeated it more slowly and with added emphasis, finishing, "Spaceships undertaking l o n g absence from base cannot be handicapped by homesick crews. We picked men without homes because they can leave Huld and not care a hoot. They are pioneers!"

" 'Young, healthy, without ties,' " she quoted. "That makes them strong?"

"Definitely," he asserted.

"Men especially selected for space. Strong men." Her lashes hid her eyes as she looked down at her narrow feet. "But now they are not in space. They are here, on firm ground."

"What of it," he demanded.

"Nothing." Stretching her arms wide, she took a deep breath, then dimpled at him. "Nothing at all."

"You're only a child," he reminded, scornfully. "When you grow older—"

"You'll have more sense," she finished for him, chanting it in a high, sweet voice. "You'll have more sense, you'll have more sense. When you grow older you'll have more sense, tra-la-la-lala!"

Gnawing irritatedly at his lip, he walked past her, started down the hill toward the ships.

"Where are you going?"

"Back!" he snapped.

"Do you like it down there?" Her eyebrows arched in surprise.

Stopping ten paces away, he scowled at her. "Is it any of your business?"

"I didn't mean to be inquisitive," she apologized. "I asked because . . . because—"

"Because what?"

"I was wondering whether you would care to visit my house."

"Nonsense! Impossible!" He turned to continue downhill.

"Father suggested it. He thought you might like to share a meal. A fresh one. A change of diet. Something to break the monotony of your supplies." The wind lifted her crimson hair and played with it as she regarded him speculatively. "He consulted Fane and Parth. They said it was an excellent idea."

"They did, did they?" His features seemed molded in iron. "Tell Fane and Parth they are to report to me at sunset." He paused, added, "Without fail!"

Resuming her seat on the rock, she watched him stride heavily down the slope toward the double star-formation. Her hands were together in her lap, much as he had held his. But hers sought nothing of each other. In complete repose, they merely rested with the ineffable patience of hands as old as time.

Seeing at a glance that he was

liverish, Jusik promptly postponed certain suggestions that he had in mind.

"Summon captains Drek and Belthan," Cruin ordered. When the other had gone, he flung his helmet onto the desk, surveyed himself in a mirror. He was still smoothing the tired lines on his face when approaching footsteps sent him officiously behind his desk.

Entering, the two captains saluted, remained rigidly at attention. Cruin studied them irefully while they preserved wooden expressions.

Eventually, he said: "I found four men lounging like undisciplined hoboes outside the safety zone." He stared at Drek. "They were from your vessel." The stare shifted to Belthan. "You are today's commander of the guard. Have either of you anything to say?"

"They were off-duty and free to leave the ship," explained Drek. "They had been warned not to go beyond the perimeter of ash."

"I don't know how they slipped through," said Belthan, in official monotone. "Obviously the guards were lax. The fault is mine."

"It will count against you in your promotion records," Cruin promised. "Punish these four, and the responsible guards, as laid down in the manual of procedure and discipline." He leaned across the desk to survey them more closely. "A repetition will bring ceremonial demotion!"

"Yes, sir," they chorused.

Dismissing them, he glanced at Jusik. "When tutors Fane and Parth report here, send them in to me without delay."

"As you order, sir."

Cruin dropped the glance momentarily, brought it back. "What's the matter with you?"

"Me?" Jusik became self-conscious. "Nothing, sir."

"You lie! One has to live with a person to know him. I've lived on your neck for three years. I know you too well to be deceived. You have something on your mind."

"It's the men," admitted Jusik, resignedly.

"What of them?"

"They are restless."

"Are they? Well, I can devise a cure for that! What's making them restless?"

"Several things, sir."

Cruin waited while Jusik stayed dumb, then roared: "Do I have to prompt you?"

"No, sir," Jusik protested, unwillingly. "It's many things. Inactivity. The substitution of tedious routine. The constant waiting, waiting, waiting right on top of three years close incarceration. They wait—and nothing happens."

"What else?"

"The sight and knowledge of familiar life just beyond the ash. The realization that Fane and Parth and the others are enjoying it with your consent. The stories told by the scouts about their experiences on landing." His gaze was steady as he went on. "We've now sent out

five squadrons of scouts, a total of forty vessels. Only six came back on time. All the rest were late on one plausible pretext or another. The pilots have talked, and shown the men various souvenir photographs and a few gifts. One of them is undergoing punishment for bringing back some bottles of paralysis-mixture. But the damage has been done. Their stories have unsettled the men."

"Anything more?"

"Begging your pardon, sir, there was also the sight of you taking a stroll to the top of the hill. They envied you even that!" He looked squarely at Cruin. "I envied you myself."

"I am the commander," said Cruin.

"Yes, sir." Jusik kept his gaze on him but added nothing more.

If the second commander expected a delayed outburst, he was disappointed. A complicated series of emotions chased each other across his superior's broad, beefy features. Laying back in his chair, Cruin's eyes looked absently through the port while his mind juggled with Jusik's words.

Suddenly, he rasped: "I have observed more, anticipated more and given matters more thought than perhaps you realize. I can see something which you may have failed to perceive. It has caused me some anxiety. Briefly, if we don't keep pace with the march of time we're going to find ourselves in a fix."

"Indeed, sir?"

"I don't wish you to mention this to anyone else: I suspect that we are trapped in a situation bearing no resemblance to any dealt with in the manuals."

"Really, sir?" Jusik licked his lips, felt that his own outspokenness was leading into unexpected paths.

"Consider our present circumstances," Cruin went on. "We are established here and in possession of power sufficient to enslave this planet. Any one of our supply of bombs could blast a portion of this earth stretching from horizon to horizon. But they're of no use unless we apply them effectively. We can't drop them anywhere, haphazardly. If parting with them in so improvident a manner proved unconvincing to our opponents, and failed to smash the hard core of their resistance, we would find ourselves unarmed in a hostile world. No more bombs. None nearer than six long years away, three there and three back. Therefore we must apply our power where it will do the most good." He began to massage his heavy chin. "We don't know where to apply it."

"No, sir," agreed Jusik, pointlessly.

"We've got to determine which cities are the key points of their civilization, which persons are this planet's acknowledged leaders, and where they're located. When we

strike, it must be at the nerve-centers. That means we're impotent until we get the necessary information. In turn, that means we've got to establish communication with the aid of the tutors." He started plucking at his jaw muscles. "And that takes time!"

"Quite, sir, but—"

"But while time crawls past the men's morale evaporates. This is our twelfth day and already the crews are restless. Tomorrow they'll be more so."

"I have a solution to that, sir, if you will forgive me for offering it," said Jusik, eagerly. "On Huld everyone gets one day's rest in five. They are free to do as they like, go where they like. Now if you promulgated an order permitting the men say one day's liberty in ten, it would mean that no more than ten percent of our strength would be lost on any one day. We could stand that reduction considering our power, especially if more of the others are on protective duty."

"So at last I get what was occupying your mind. It comes out in a swift flow of words." He smiled grimly as the other flushed. "I have thought of it. I am not quite so unimaginative as you may consider me."

"I don't look upon you that way, sir," Jusik protested.

"Never mind. We'll let that pass. To return to this subject of liberty —there lies the trap! There is the very quandary with which no manual deals, the situation for which I can find no officially prescribed formula." Putting a hand on his desk he tapped the polished surface impatiently. "If I refuse these men a little freedom, they will become increasingly restless—naturally. If I permit them the liberty they desire, they will experience contact with life more normal even though alien, and again become more restless—naturally!"

"Permit me to doubt the latter, sir. Our crews are loyal to Huld. Blackest space forbid that it should be otherwise!"

"They were loyal. Probably they are still loyal." Cruin's face quirked as his memory brought forward the words that followed. "They are young, healthy, without ties. In space, that means one thing. Here, another." He came slowly to his feet, big, bulky and imposing. "I *know!*"

Looking at him, Jusik felt that indeed he did know. "Yes, sir," he parroted, obediently.

"Therefore the onus of what to do for the best falls squarely upon me. I must use my initiative. As second commander it is for you to see that my orders are carried out to the letter."

"I know my duty, sir." Jusik's thinly-drawn features registered growing uneasiness.

"And it is my final decision that the men must be restrained from contact with our opponents, with no exceptions other than the four technicians operating under my orders. The crews are to be permitted no

liberty, no freedom to go beyond the ash. Any form of resentment on their part must be countered immediately and ruthlessly. You will instruct the captains to watch for murmurers in their respective crews and take appropriate action to silence them as soon as found." His jowls lumped, and his eyes were cold as he regarded the other. "All scout-flights are canceled as from now, and all scout-vessels remain grounded. None moves without my personal instructions."

"That is going to deprive us of a lot of information," Jusik observed. "The last flight to the south reported discovery of ten cities completely deserted, and that's got some significance which we ought to—"

"I said the flights are canceled!" Cruin shouted. "If I say the scout-vessels are to be painted pale pink, they will be painted pale pink, thoroughly, completely, from end to end. I am the commander!"

"As you order, sir."

"Finally, you may instruct the captains that their vessels are to be prepared for my inspection at midday tomorrow. That will give the crews something to do."

"Very well, sir."

With a worried salute, Jusik opened the door, glanced out and said: "Here are Fane, Kalma, Parth and Hefni, sir."

"Show them in."

After Cruin had given forcible expression to his views, Fane said: "We appreciate the urgency, sir, and we are doing our best, but it is doubtful whether they will be fluent before another four weeks have passed. They are slow to learn."

"I don't want fluency," Cruin growled. "All they need are enough words to tell us the things we want to know, the things we *must* know before we can get anywhere."

"I said sufficient fluency," Fane reminded. "They communicate mostly by signs even now."

"That flame-headed girl didn't."

"She has been quick," admitted Fane. "Possibly she has an above-normal aptitude for languages. Unfortunately she knows the least in any military sense and therefore is of little use to us."

Cruin's gaze ran over him balefully. His voice became low and menacing. "You have lived with these people many days. I look upon your features and find them different. Why is that?"

"Different?" The four exchanged wondering looks.

"Your faces have lost their lines, their space-gauntness. Your cheeks have become plump, well-colored. Your eyes are no longer tired. They are bright. They hold the self-satisfied expression of a fat *skodar* wallowing in its trough. It is obvious that you have done well for yourselves." He bent forward, his mouth ugly. "Can it be that you are in no great hurry to complete your task?"

They were suitably shocked.

"We have eaten well and slept regularly," Fane said. "We feel

better for it. Our physical improvement has enabled us to work so much the harder. In our view, the foe is supporting us unwittingly with his own hospitality, and since the manual of—"

"Hospitality?" Cruin cut in, sharply.

Fane went mentally off-balance as vainly he sought for a less complimentary synonym.

"I give you another week," the commander harshed. "No more. Not one day more. At this time, one week from today, you will report here with the six prisoners adequately tutored to understand my questions and answer them."

"It will be difficult, sir."

"Nothing is difficult. Nothing is impossible. There are no excuses for anything." He studied Fane from beneath forbidding brows. "You have my orders—obey them!"

"Yes, sir."

His hard stare shifted to Kalma and Hefni. "So much for the tutors; now *you*. What have you to tell me? How much have you discovered?"

Blinking nervously, Hefni said: "It is not a lot. The language trouble is—"

"May the Giant Sun burn up and perish the language trouble! How much have you learned while enjoyably larding your bellies?"

Glancing down at his uniform-belt as if suddenly and painfully conscious of its tightness, Hefni recited: "They are exceedingly strange in so far as they appear to be highly civilized in a purely domestic sense but quite primitive in all others. This Meredith family lives in a substantial, well-equipped house. They have every comfort, including a color-television receiver."

"You're dreaming! We are still seeking the secrets of plain television even on Huld. Color is unthinkable."

Kalma chipped in with: "Nevertheless, sir, they have it. We have seen it for ourselves."

"That is so," confirmed Fane.

"Shut up!" Cruin burned him with a glare. "I have finished with you. I am now dealing with these two." His attention returned to the quaking Hefni: "Carry on."

"There is something decidedly queer about them which we've not yet been able to understand. They have no medium of exchange. They barter goods for goods without any regard for the relative values of either. They work when they feel like it. If they don't feel like it, they don't work. Yet, in spite of this, they work most of the time."

"Why?" demanded Cruin, incredulously.

"We asked them. They said that one works to avoid boredom. We cannot comprehend that viewpoint." Hefni made a defeated gesture. "In many places they have small factories which, with their strange, perverted logic, they use as amusement centers. These plants operate only when people turn up to work."

"Eh?" Cruin looked baffled.

"For example, in Williamsville, a small town an hour's walk beyond the Meredith home, there is a shoe factory. It operates every day. Some days there may be only ten workers there, other days fifty or a hundred, but nobody can remember a time when the place stood idle for lack of one voluntary worker. Meredith's elder daughter, Marva, has worked there three days during our stay with them. We asked her the reason."

"What did she say?"

"For fun."

"Fun . . . fun . . . fun?" Cruin struggled with the concept. "What does that mean?"

"We don't know," Hefni confessed. "The barrier of speech—"

"Red flames lick up the barrier of speech!" Cruin bawled. "Was her attendance compulsory?"

"No, sir."

"You are certain of that?"

"We are positive. One works in a factory for no other reason than because one feels like it."

"For what reward?" topped Cruin, shrewdly.

"Anything or nothing." Hefni uttered it like one in a dream. "One day she brought back a pair of shoes for her mother. We asked if they were her reward for the work she had done. She said they were not, and that someone named George had made them and given them to her. Apparently the rest of the factory's output for that week was shipped to another town where shoes were required. This other town is going to send back a supply of leather, nobody knows how much—and nobody seems to care."

"Senseless," defined Cruin. "It is downright imbecility." He examined Hefni as if suspecting him of inventing confusing data. "It is impossible for even the most primitive of organizations to operate so haphazardly. Obviously you have seen only part of the picture; the rest has been concealed from you, or you have been too dull-witted to perceive it."

"I assure you, sir," began Hefni.

"Let it pass," Cruin cut in. "Why should I care how they function economically? In the end, they'll work the way *we* want them to!" He rested his heavy jaw in one hand. "There are other matters which interest me more. For instance, our scouts have brought in reports of many cities. Some are organized but grossly underpopulated; others are completely deserted. The former have well-constructed landing places with air-machines making use of them. How is it that people so primitive have air-machines?"

"Some make shoes, some make air-machines, some play with television. They work according to their aptitudes as well as their inclinations."

"Has this Meredith got an air-machine?"

"No." The look of defeat was etched more deeply on Hefni's face. "If he wanted one he would have

his desire inserted in the television supply-and-demand program."

"Then what?"

"Sooner or later, he'd get one, new or secondhand, either in exchange for something or as a gift."

"Just by asking for it?"

"Yes."

Getting up, Cruin strode to and fro across his office. The steel heel-plates on his boots clanked on the metal floor in rhythm with the bells. He was ireful, impatient, dissatisfied.

"In all this madness is nothing which tells us anything of their true character or their organization." Stopping his stride, he faced Hefni. "You boasted that *you* were to be the eyes and ears." He released a loud snort. "Blind eyes and deaf ears! Not one word about their numerical strength, not one—"

"Pardon me, sir," said Hefni, quickly, "there are twenty-seven millions of them."

"Ah!" Cruin registered sharp interest. "Only twenty-seven millions? Why, there's a hundred times that number on Huld which has no greater area of land surface." He mused a moment. "Greatly underpopulated. Many cities devoid of a living soul. They have air-machines and other items suggestive of a civilization greater than the one they now enjoy. They operate the remnants of an economic system. You realize what all this means?"

Hefni blinked, made no reply. Kalma looked thoughtful. Fane and Parth remained blank-faced and tight-lipped.

"It means two things," Cruin pursued. "War or disease. One or the other, or perhaps both—and on a large scale. I want information on that. I've got to learn what sort of weapons they employed in their war, how many of them remain available, and where. Or, alternatively, what disease ravished their numbers, its source, and its cure." He tapped Hefni's chest to emphasize his words. "I want to know what they've got hidden away, what they're trying to keep from your knowledge against the time when they can bring it out and use it against us. Above all, I want to know which people will issue orders for their general offensive and where they are located."

"I understand, sir," said Hefni, doubtfully.

"That's the sort of information I need from your six specimens. I want information, not invitations to meals!" His grin was ugly as he noted Hefni's wince. "If you can get it out of them before they're due here, I shall enter the fact on the credit side of your records. But if I, your commander, have to do your job by extracting it from them myself—" Ominously, he left the sentence unfinished.

Hefni opened his mouth, closed it, glanced nervously at Kalma who stood stiff and dumb at his side.

"You may go," Cruin snapped at the four of them. "You have one

week. If you fail me, I shall deem it a front-line offense and deal with it in accordance with the active-service section of the manual of procedure and discipline."

They were pale as they saluted. He watched them file out, his lips curling contemptuously. Going to the port, he gazed into the gathering darkness, saw a pale star winking in the east. Low and far it was —but not so far as Huld.

In the mid-period of the sixteenth day, Commander Cruin strode forth polished and bemedaled, directed his bell-jangling feet toward the hill. A sour-faced guard saluted him at the edge of the ash and made a slovenly job of it.

"Is that the best you can do?" He glared into the other's surly eyes. "Repeat it!"

The guard saluted a fraction more swiftly.

"You're out of practice," Cruin informed. "Probably all the crews are out of practice. We'll find a remedy for that. We'll have a period of saluting drill every day." His glare went slowly up and down the guard's face. "Are you dumb?"

"No, sir."

"Shut up!" roared Cruin. He expanded his chest. "Continue with your patrol."

The guard's optics burned with resentment as he saluted for the third time, turned with the regulation heel-click and marched along the perimeter.

Mounting the hill, Cruin sat on the stone at the top. Alternately he viewed the ships lying in the valley and the opposite scene with its trees, fields and distant houses. The metal helmet with its ornamental wings was heavy upon his head but he did not remove it. In the shadow beneath the projecting visor, his cold eyes brooded over the landscape to one side and the other.

She came eventually. He had been sitting there for one and a half periods when she came as he had known she would—without knowing what weird instinct had made him certain of this. Certainly, he had no desire to see her—no desire at all.

Through the trees she tripped light-footed, with Sue and Sam and three other girls of her own age. The newcomers had large, dark, humorous eyes, their hair was dark, and they were leggy.

"Oh, hello!" She paused as she saw him.

"Hello!" echoed Sue, swinging her pigtails.

"'Lo!" piped Sam, determined not to be left out.

Cruin frowned at them. There was a high gloss on his jack boots, and his helmet glittered in the sun.

"These are my friends," said Marva, in her alien-accented Huldian. "Becky, Rita and Joyce."

The three smiled at him.

"I brought them to see the ships."

Cruin said nothing.

"You don't mind them looking at the ships, do you?"

"No," he growled with reluctance.

Lankily but gracefully she seated herself on the grass. The others followed suit with the exception of Sam who stood with fat legs braced apart sucking his thumb, and solemnly studying Cruin's decorated jacket.

"Father was disappointed because you could not visit us."

Cruin made no reply.

"Mother was sorry, too. She's a wonderful cook. She loves a guest.

No reply.

"Would you care to come this evening?"

"No."

"Some other evening?"

"Young lady," he harshed, severely, "I do not pay visits. Nobody pays visits."

She translated this to the others. They laughed so heartily that Cruin reddened and stood up.

"What's funny about that?" he demanded.

"Nothing, nothing." Marva was embarrassed. "If I told you, I fear that you would not understand."

"I would not understand." His grim eyes became alert, calculating as they went over her three friends. "I do not think, somehow, that they were laughing at me. Therefore they were laughing at what I do not know. They were laughing at something I ought to know but which you do not wish to tell me." He bent over her, huge and muscular, while she looked up at him with her great green eyes. "And what remark of mine revealed my amusing ignorance?"

Her steady gaze remained on him while she made no answer. A faint but sweet scent exuded from her hair.

"I said that nobody pays visits," he repeated. "That was the amusing remark—nobody pays visits. And I am not a fool!" Straightening, he turned away. "So I am going to call the rolls!"

He could feel their eyes upon him as he started down the valley. They were silent except for Sam's high-pitched, childish, "Bye!" which he ignored.

Without once looking back, he gained his flagship, mounted its metal ladder, made his way to the office and summoned Jusik.

"Order the captains to call their rolls at once."

"Is something wrong, sir?" inquired Jusik, anxiously.

"Call the rolls!" Cruin bellowed, whipping off his helmet. "Then we'll know whether anything is wrong." Savagely, he flung the helmet onto a wall hook, sat down, mopped his forehead.

Jusik was gone for most of a period. In the end he returned, set-faced, grave.

"I regret to report that eighteen men are absent, sir."

"They laughed," said Cruin, bitterly. "They laughed—because they *knew!*" His knuckles were white as his hands gripped the arms of his chair.

"I beg your pardon, sir?" Jusik's eyebrows lifted.

"How long have they been absent?"

"Eleven of them were on duty this morning."

"That means the other seven have been missing since yesterday?"

"I'm afraid so, sir."

"But no one saw fit to inform me of this fact?"

Jusik fidgeted. "No, sir."

"Have you discovered anything else of which I have not been informed?"

The other fidgeted again, looked pained.

"Out with it, man!"

"It is not the absentees' first offense," Jusik said with difficulty. "Nor their second. Perhaps not their sixth."

"How long has this been going on?" Cruin waited a while, then bawled: "Come on! You are capable of speech!"

"About ten days, sir."

"How many captains were aware of this and failed to report it?"

"Nine, sir. Four of them await your bidding outside."

"And what of the other five?"

"They . . . they—" Jusik licked his lips.

Cruin arose, his expression dangerous. "You cannot conceal the truth by delaying it."

"They are among the absentees, sir."

"I see!" Cruin stamped to the door, stood by it. "We can take it for granted that others have absented themselves without permission, but were fortunate enough to be here when the rolls were called. That is their good luck. The real total of the disobedient cannot be discovered. They have sneaked away like nocturnal animals, and in the same manner they sneak back. All are guilty of desertion in the face of the enemy. There is one penalty for that."

"Surely, sir, considering the circ—"

"Considering nothing!" Cruin's voice shot up to an enraged shout. "Death! The penalty is death!" Striding to the table, he hammered the books lying upon it. "Summary execution as laid down in the manual of procedure and discipline. Desertion, mutinous conduct, defiance of a superior officer, conspiracy to thwart regulations and defy my orders—all punishable by death!" His voice lowered as swiftly as it had gone up. "Besides, my dear Jusik, if we fail through disintegration attributable to our own deliberate disregard of the manuals, what will be the penalty payable by *us?* What will it be, eh?"

"Death," admitted Jusik. He looked at Cruin. "On Huld, anyway."

"We are on Huld! *This* is Huld! I have claimed this planet in the name of Huld and therefore it is part of it."

"A mere claim, sir, if I may say—"

"Jusik, are *you* with these con-

spirators in opposing my authority?" Cruin's eyes glinted. His hand lay over his gun.

"Oh, no, sir!" The second commander's features mirrored the emotions conflicting within him. "But permit me to point out, sir, that we are a brotherly band who've been cooped together a long, long time and already have suffered losses getting here as we shall do getting back. One can hardly expect the men to—"

"I expect obedience!" Cruin's hand remained on the gun. "I expect iron discipline and immediate, willing, unquestionable obedience. With those, we conquer. Without them, we fail." He gestured to the door. "Are those captains properly prepared for examination as directed in the manuals?"

"Yes, sir. They are disarmed and under guard."

"Parade them in." Leaning on the edge of his desk, Cruin prepared to pass judgment on his fellows. The minute he waited for them was long, long as any minute he had ever known.

There had been scent in her hair.
And her eyes were cool and green.
Iron discipline must be maintained.
The price of power.

The manual provided an escape. Facing the four captains, he found himself taking advantage of the legal loophole to substitute demotion for the more drastic and final penalty.

Tramping the room before them while they stood in a row, pale-faced and rigid, their tunics unbuttoned, their ceremonial belts missing, the guards impassive on either side of them, he rampaged and swore and sprinkled them with verbal vitriol while his right fist hammered steadily into the palm of his left hand.

"But since you were present at the roll call, and therefore are not technically guilty of desertion, and since you surrendered yourselves to my judgment immediately you were called upon to do so, I hereby sentence you to be demoted to the basic rank, the circumstances attending this sentence to be entered in your records." He dismissed them with a curt flourish of his white-gloved hand. "That is all."

They filed out silently.

He looked at Jusik. "Inform the respective lieutenant captains that they are promoted to full captains and now must enter recommendations for their vacated positions. These must be received by me before nightfall."

"As you order, sir."

"Also warn them to prepare to attend a commanding officer's court which will deal with the lower-ranking absentees as and when they reappear. Inform Captain Somir that he is appointed commander of the firing squad which will carry out the decisions of the court immediately they are pronounced."

"Yes, sir." Gaunt and hollow-

eyed, Jusik turned with a click of heels and departed.

When the closer had shut the door, Cruin sat at his desk, placed his elbows on its surface, held his face in his hands. If the deserters did not return, they could not be punished. No power, no authority could vent its wrath upon an absent body. The law was impotent if its subject lacked the essential feature of being present. All the laws of Huld could not put memories of lost men before a firing squad.

It was imperative that he make an example of the offenders. Their sly, furtive trips into the enemy's camp, he suspected, had been repeated often enough to have become a habit. Doubtless by now they were settled wherever they were visiting, sharing homes—welcome rooms—sharing food, company, laughter. Doubtless they had started to regain weight, to lose the space lines on their cheeks and foreheads, and the light in their eyes had begun to burn anew; and they had talked with signs and pictures, played games, tried to suck smoke things, and strolled with girls through the fields and the glades.

A pulse was beating steadily in the thickness of his neck as he stared through the port and waited for some sign that the tripled ring of guards had caught the first on his way in. Down, down, deep down inside him at a depth too great for him to admit that it was there, lay the disloyal hope that none would return.

One deserter would mean the slow, shuffling tread of the squad, the hoarse calls of, "Aim!" and "Fire," and the stepping forward of Somir, gun in hand, to administer the mercy shot.

Damn the manuals.

At the end of the first period after nightfall Jusik burst into the office, saluted, breathed heavily. The glare of the ceiling illumination deepened the lines on his thin features, magnified the bristles on his unshaven chin.

"Sir, I have to report that the men are getting out of control."

"What d'you mean?" Cruin's heavy brows came down as he stared fiercely at the other.

"They know of the recent demotions, of course. They know also that a court will assemble to deal with the absentees." He took another long-drawn breath. "And they also know the penalty these absentees must face."

"So?"

"So more of them have deserted —they've gone to warn the others not to return."

"Ah!" Cruin smiled lopsidedly. "The guards let them walk out, eh? Just like that?"

"Ten of the guards went with them," said Jusik.

"Ten?" Coming up fast, Cruin moved near to the other, studied him searchingly. "How many went altogether?"

"Ninety-seven."

Grabbing his helmet, Cruin

slammed it on, pulled the metal chin strap over his jaw muscles. "More than one complete crew." He examined his gun, shoved it back, strapped on a second one. "At that rate they'll all be gone by morning." He eyed Jusik. "Don't you think so?"

"That's what I'm afraid of, sir."

Cruin patted his shoulder. "The answer, Jusik, is an easy one—we take off immediately."

"Take off?"

"Most certainly. The whole fleet. We'll strike a balanced orbit where it will be impossible for any man to leave. I will then give the situation more thought. Probably we'll make a new landing in some locality where none will be tempted to sneak away because there'll be nowhere to go. A scout can pick up Fane and his party in due course."

"I doubt whether they'll obey orders for departure, sir."

"We'll see, we'll see." He smiled again, hard and craggy. "As you would know if you'd studied the manuals properly, it is not difficult to smash incipient mutiny. All one has to do is remove the ringleaders. No mob is composed of men, as such. It is made up of a few ringleaders and a horde of stupid followers." He patted his guns. "You can always tell a ringleader—invariably he is the first to open his mouth!"

"Yes, sir," mouthed Jusik, with misgivings.

"Sound the call for general assembly."

The flagship's siren wailed dismally in the night. Lights flashed from ship to ship, and startled birds woke up and squawked in the trees beyond the ash.

Slowly, deliberately, impressively, Cruin came down the ladder, faced the audience whose features were a mass of white blobs in the glare of the ships' beams. The captains and lieutenant captains ranged themselves behind him and to either side. Each carried an extra gun.

"After three years of devoted service to Huld," he enunciated pompously, "some men have failed me. It seems that we have weaklings among us, weaklings unable to stand the strain of a few extra days before our triumph. Careless of their duty they disobey orders, fraternize with the enemy, consort with our opponents' females, and try to snatch a few creature comforts at the expense of the many." His hard, accusing eyes went over them. "In due time they will be punished with the utmost severity."

They stared back at him expressionlessly. He could shoot the ears off a running man at twenty-five yards, and he was waiting for his target to name itself. So were those at his side.

None spoke.

"Among you may be others equally guilty but not discovered. They need not congratulate themselves, for they are about to be deprived of further opportunities to

exercise their disloyalty." His stare kept flickering over them while his hand remained ready at his side. "We are going to trim the ships and take off, seeking a balanced orbit. That means lost sleep and plenty of hard work for which you have your treacherous comrades to thank." He paused a moment, finished with: "Has anyone anything to say?"

One man holding a thousand.

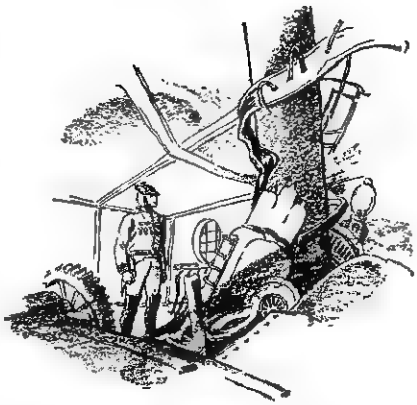
Silence.

"Prepare for departure," he snapped, and turned his back upon them.

Captain Somir, now facing him, yelped: "Look out, commander!" and whipped up his gun to fire over Cruin's shoulder.

Cruin made to turn, conscious of a roar behind him, his guns coming out as he twisted around. He heard no crack from Somir's weapon, saw no more of his men as their roar cut off abruptly. There seemed to be an intolerable weight upon his skull, the grass came up to meet him, he let go his guns and put out his hands to save himself. Then the hazily dancing lights faded from his eyesight and all was black.

Deep in his sleep he heard vaguely and uneasily a prolonged stamping of feet, many dull, elusive sounds as of people shouting far, far away. This went on for a considerable time, and ended with a series of violent reports that shook the ground beneath his body.



Someone splashed water over his face.

Sitting up, he held his throbbing head, saw pale fingers of dawn feeling through the sky to one side. Blinking his aching eyes to clear them, he perceived Jusik, Somir and eight others. All were smothered in dirt, their faces bruised, their uniforms torn and bedraggled.

"They rushed us the moment you turned away from them," explained Jusik, morbidly. "A hundred of them in the front. They rushed us in one united frenzy, and the rest followed. There were too many for us." He regarded his superior with red-rimmed optics. "You have been flat all night."

Unsteadily, Cruin got to his feet, teetered to and fro. "How many were killed?"

"None. We fired over their heads. After that—it was too late."

"Over their heads?" Squaring his massive shoulders, Cruin felt a sharp pain in the middle of his back,

ignored it. "What are guns for if not to kill?"

"It isn't easy," said Jusik, with the faintest touch of defiance. "Not when they're one's own comrades."

"Do you agree?" The commander's glare challenged the others.

They nodded miserably, and Somir said: "There was little time, sir, and if one hesitates, as we did, it becomes—"

"There are no excuses for anything. You had your orders; it was for you to obey them." His hot gaze burned one, then the other. "You are incompetent for your rank. You are both demoted!" His jaw came forward, ugly, aggressive, as he roared: "Get out of my sight!"

They mooched away. Savagely, he climbed the ladder, entered his ship, explored it from end to end. There was not a soul on board. His lips were tight as he reached the tail, found the cause of the earth-rocking detonations. The fuel tanks had been exploded, wrecking the engines and reducing the whole vessel to a useless mass of metal.

Leaving, he inspected the rest of his fleet. Every ship was the same, empty and wrecked beyond possibility of repair. At least the mutineers had been thorough and logical in their sabotage. Until a report-vessel arrived, the home world of Huld had no means of knowing where the expedition had landed. Despite even a systematic and wide-scale search it might well be a thousand years before Huldians found this particular planet again. Effectively the rebels had marooned themselves for the rest of their natural lives and placed themselves beyond reach of Huldian retribution.

Tasting to the full the bitterness of defeat, he squatted on the bottom rung of the twenty-second vessel's ladder, surveyed the double star-formations that represented his ruined armada. Futilely, their guns pointed over surrounding terrain. Twelve of the scouts, he noted, had gone. The others had been rendered as useless as their parent vessels.

Raising his gaze to the hill, he perceived silhouettes against the dawn where Jusik, Somir and the others were walking over the crest, walking away from him, making for the farther valley he had viewed so often. Four children joined them at the top, romped beside them as they proceeded. Slowly the whole group sank from sight under the rising sun.

Returning to the flagship, Cruin packed a patrol sack with personal possessions, strapped it on his shoulders. Without a final glance at the remains of his once-mighty command he set forth away from the sun, in the direction opposite to that taken by the last of his men.

His jack boots were dull, dirty. His orders of merit hung lopsidedly and had a gap where one had been torn off in the fracas. The bell was missing from his right boot; he en-

dured the pad-*ding*, pad-*ding* of its fellow for twenty steps before he unscrewed it and slung it away.

The sack on his back was heavy, but not so heavy as the immense burden upon his mind. Grimly, stubbornly he plodded on, away from the ships, far, far into the morning mists—facing the new world alone.

Three and a half years had bitten deep into the ships of Huld. Still they lay in the valley, arranged with mathematical precision, noses in, tails out, as only authority could place them. But the rust had eaten a quarter of the way through the thickness of their tough shells, and their metal ladders were rotten and treacherous. The field mice and the voles had found refuge beneath them; the birds and spiders had sought sanctuary within them. A lush growth had sprung from encompassing ash, hiding the perimeter for all time.

The man who came by them in the midafternoon rested his pack and studied them silently, from a distance. He was big, burly, with a skin the color of old leather. His deep gray eyes were calm, thoughtful as they observed the thick ivy climbing over the flagship's tail.

Having looked at them for a musing half hour he hoisted his pack and went on, up the hill, over the crest and into the farther valley. Moving easily in his plain, loose-fitting clothes, his pace was deliberate, methodical.

Presently he struck a road, followed it to a stone-built cottage in the garden of which a lithe, dark-haired woman was cutting flowers. Leaning on the gate, he spoke to her. His speech was fluent but strangely accented. His tones were gruff but pleasant.

"Good afternoon."

She stood up, her arms full of gaudy blooms, looked at him with rich, black eyes. "Good afternoon." Her full lips parted with pleasure. "Are you touring? Would you care to guest with us? I am sure that Jusik—my husband—would be delighted to have you. Our welcome room has not been occupied for—"

"I am sorry," he chipped in. "I am seeking the Merediths. Could you direct me?"

"The next house up the lane." Deftly, she caught a falling bloom, held it to her breast. "If their welcome room has a guest, please remember us."

"I will remember," he promised. Eying her approvingly, his broad, muscular face lit up with a smile. "Thank you so much."

Shouldering his pack he marched on, conscious of her eyes following him. He reached the gate of the next place, a long, rambling, picturesque house fronted by a flowering garden. A boy was playing by the gate.

Glancing up as the other stopped near him, the boy said: "Are you touring, sir?"

"Sir?" echoed the man. "*Sir?*" His face quirked. "Yes, sonny, I

am touring. I'm looking for the Merediths."

"Why, I'm Sam Meredith!" The boy's face flushed with sudden excitement. "You wish to guest with us?"

"If I may."

"Yow-ee!" He fled frantically along the garden path, shrieking at the top of his voice, "Mom, Pop, Marva, Sue—we've got a guest!"

A tall, red-headed man came to the door, pipe in mouth. Coolly, calmly, he surveyed the visitor.

After a little while, the man removed the pipe and said: "I'm Jake Meredith. Please come in." Standing aside, he let the other enter, then called, "Mary, Mary, can you get a meal for a guest?"

"Right away," assured a cheerful voice from the back.

"Come with me." Meredith led the other to the veranda, found him an easy-chair. "Might as well rest while you're waiting. Mary takes time. She isn't satisfied until the legs of the table are near to collapse —and woe betide you if you leave anything."

"It is good of you." Seating himself, the visitor drew a long breath, gazed over the pastoral scene before him.

Taking another chair, Meredith applied a light to his pipe. "Have you seen the mail ship?"

"Yes, it arrived early yesterday. I was lucky enough to view it as it passed overhead."

"You certainly were lucky considering that it comes only once in four years. I've seen it only twice, myself. It came right over this house. An imposing sight."

"Very!" indorsed the visitor, with unusual emphasis. "It looked to me about five miles long, a tremendous creation. Its mass must be many times greater than that of all those alien ships in the valley."

"Many times," agreed Meredith.

The other leaned forward, watching his host. "I often wonder whether those aliens attributed smallness of numbers to war or disease, not thinking of large-scale emigration, nor realizing what it means."

"I doubt whether they cared very much seeing that they burned their boats and settled among us." He pointed with the stem of his pipe. "One of them lives in that cottage down there. Jusik's his name. Nice fellow. He married a local girl eventually. They are very happy."

"I'm sure they are."

They were quiet a long time, then Meredith spoke absently, as if thinking aloud. "They brought with them weapons of considerable might, not knowing that we have a weapon truly invincible." Waving one hand, he indicated the world at large. "It took us thousands of years to learn about the sheer invincibility of an idea. That's what we've got—a way of life, an idea. Nothing can blast that to shreds. Nothing can defeat an idea—except a better one." He put the pipe back in his mouth. "So far, we have

failed to find a better one."

"They came at the wrong time," Meredith went on. "Ten thousand years too late." He glanced sidewise at his listener. "Our history covers a long, long day. It was so lurid that it came out in a new edition every minute. But this one's the late night final."

"You philosophize, eh?"

Meredith smiled. "I often sit here to enjoy my silences. I sit here and think. Invariably I end up with the same conclusion."

"What may that be?"

"That if I, personally, were in complete possession of all the visible stars and their multitude of planets I would still be subject to one fundamental limitation"—bending, he tapped his pipe on his heel—"in this respect—that no man can eat more than his belly can hold." He stood up, tall, wide-chested. "Here comes my daughter, Marva. Would you like her to show you your room?"

Standing inside the welcome room, the visitor surveyed it appreciatively. The comfortable bed, the bright furnishings.

"Like it?" Marva asked.

"Yes, indeed." Facing her, his gray eyes examined her. She was tall, red-haired, green-eyed, and her figure was ripe with the beauty of young womanhood. Pulling slowly at his jaw muscles, he asked: "Do you think that I resemble Cruin?"

"Cruin?" Her finely curved brows crinkled in puzzlement.

"The commander of that alien expedition."

"Oh, him!" Her eyes laughed, and the dimples came into her cheeks. "How absurd! You don't look the least bit like him. He was old and severe. You are *young*—and far more handsome."

"It is kind of you to say so," he murmured. His hands moved aimlessly around in obvious embarrassment. He fidgeted a little under her frank, self-possessed gaze. Finally, he went to his pack, opened it. "It is conventional for the guest to bring his hosts a present." A tinge of pride crept into his voice. "So I have brought one. I made it myself. It took me a long time to learn . . . a long time . . . with these clumsy hands. About three years."

Marva looked at it, raced through the doorway, leaned over the balustrade and called excitedly down the stairs. "Pop, Mom, our guest has a wonderful present for us. A clock. A clock with a little metal bird that calls the time."

Beneath her, feet bustled along the passage and Mary's voice came up saying: "May I see it? Please let me see it." Eagerly, she mounted the stairs.

As he waited for them within the welcome room, his shoulders squared, body erect as if on parade, the clock whirred in Cruin's hands and its little bird solemnly fluted twice.

The hour of triumph.

THE END

BUREAU OF SLICK TRICKS

BY H. B. FYFE

***One** of the inevitable problems of dealing with alien races is the simple fact that there is, and can be no absolute definition of "right" or "fair". It's a fluid concept—and the Bureau was very, very fluid. . . .*

Illustrated by Cartier

Ramsay stood on the smooth, springy floor of the empty anteroom, staring absently at the wall map of Terra's economic empire and trying to decide whether he was there by invitation or under duress.

Certainly, the suave young man had been very apologetic about interrupting Ramsay's vacation. He had also been alert to haul the tall, black-haired spaceman from the path of that water-logged Venusian, speeding down the hall outside in his three-wheeled, air-tight tank.

Yes, Tom, he muttered to himself, *two years in space and you don't know how to act on Terra.*

Something about the stellar map disturbed him. Surely the star Cagsan was not that near to Sol. And where was the whole Fegashite binary system?

For foreign visitors, I suppose, he thought.

The map might well be deliberately distorted. As the economic crossroads of a sector of the galaxy, Terra sometimes was reluctant to reveal the exact locations of rich planets. In fact, communications to some star systems were often practically secret.

The map did show, in rather schematic fashion, the relationship of Sol with the multitude of stars lying out toward the "edge" of the galaxy, as well as points of contact with the vague and mighty civilizations farther toward the center. Finding profitable the role of middleman for a large volume of space, Terra had become a sort of front office for exploiting a huge trading empire. One of the devices useful to its interstellar "credit diplomacy" was the Bureau of Special Trading.

This was a scattered, intricate organization, designed to handle all the delicately shady problems arising from intercourse with thousands of different worlds—many of

BUREAU OF SLICK TRICKS

them with peculiar views of their own importance or adhering to quite exotic codes of behavior.

A musical note sounded, followed by a voice from an address system, requesting Mr. Ramsay to step into the office.

Ramsay slid open the door and strode into the next room. His calf-high spaceman's boots sank noticeably into the floor as the man behind the desk rose to greet him.

"Good afternoon," said a pleasant baritone.

The occupant of the office was dressed informally. His light-blue slacks and full-cut turquoise neck scarf contrasted pleasantly with a wine-colored jacket of the current draped and belted style. Feeling very dull in his dark green, Ramsay wished he had at least worn one of his new gold and red neck scarves.

He was waved into a comfortable chair, and in a few minutes began to feel more at ease. J. Gilbert Fuller was a very superior type indeed, but he was frank to confide to Ramsay that he was worried.

"And you say I can help you?" the spaceman asked, wondering if the wavy golden hair above his host's ruddily tanned features could possibly be natural.

Fuller maintained an amiable expression, but raised a nervous finger to stroke his trim mustache.

"I am sure that you can," he said. "Ah . . . perhaps I should first explain the . . . functions . . . of the Bureau."

"I've heard of it," said Ramsay.

"Oh. Well, then, of course you know that our main occupation is encouraging that sort of good will which influences visitors to continue doing business with Terra."

"And in keeping them happy," agreed Ramsay pleasantly, "you find it necessary to do some queer things."

Fuller's hands and features joined in an expressive gesture, suggesting bland denial, deprecating modesty, and willingness to treat Ramsay as a knowing insider.

"Oh, I know those jokes that have become popular," he chuckled. "Wild deals by the Bureau of 'Slick Tricks'—but they are merely hearsay. I can offer only a routine matter for your interest."

"What makes me so special?" asked Ramsay.

"What makes you specially valuable? The fact, to speak loosely, that you are the only man available at the moment who can speak Kosorian."

Ramsay straightened in his chair. He decided that Fuller probably never spoke loosely. How thoroughly had they checked him beforehand?

"That," he said slowly, "was a place I was glad to blast off from. How did you know about it?"

"Well . . . anyhow, it seems to be as near to the absolute Edge as any Terran has ventured. Nevertheless, a spaceship from that star is due to land on Terra shortly."

"From Kosor?" demanded Ramsay.

"Yes, a patrol rocket has just brought down three of their representatives. You know our policy of supplying interpreters familiar with the customs and language of our visitors. Unfortunately, speakers of Kosorian are few; the Deep Space Agency listed only you at present on Terra."

Ramsay stared at him.

"Did you say they were going to land *on* Terra?"

"Yes, I did."

"Do you know their propulsion methods?"

"Why, the Bureau signaled them in interstellar code, explaining which ships can land, what sizes have to land on Luna or the other planets, and that atomic-powered rockets must take up orbits around Luna while their freight is lightered down to Terra. They made no declaration of restriction."

"Watch out for them!" warned Ramsay.

"What do you mean?"

"Kosorians are . . . well, it wouldn't even occur to them to take the trouble to obey a law. Whatever they can get away with, they do."

"Are you telling me they are lawless? Criminal?"

Ramsay crossed his long legs and ran a hand through his close-cropped hair. Fuller's eyes followed the motion, staring at the narrow scar running back from the spaceman's left temple.

"That's not it *exactly*," said Ramsay. "They have a few general laws of a queer sort. They stick to them when it's convenient. They're . . . what's the word I want? . . . they're amoral. They just don't think the way we do."

"But we have no repressive statutes," protested Fuller. "There should be no cause for friction."

"Don't you get it?" demanded Ramsay. "Just for example, when I was there, they were using atomic jets. Did they warn you? You better see to it they're not allowed to land directly on Terra!"

Fuller's face lost its blandness. For an instant, hardness showed through, and Ramsay sensed a wily, ruthless competence. That apparent plumpness might be layers of muscle over a stocky frame. He wondered if Fuller had anything against him.

The other turned meanwhile to his desk visor and spoke into it. Detecting a snapping undertone in the confident voice, the spaceman could imagine the stimulation of glands and the rise of blood pressure at the other end.

Fuller finished, flipped a switch, and leaned back.

"How did you make out in the Kosorian system, Ramsay?" he asked in a conversational tone.

"Got skinned to the bone. I went in there with a shipload of radium and jewels from Bormek, precision instruments from Terra, and . . . uh—"

"Go on," Fuller encouraged him. "The B.S.T. has no interest in the

dysenine you picked up around Fegash. Take a hint, however: the Interstellar Narcotics Department was quite puzzled when so much of it disappeared."

Ramsay held his features perfectly expressionless—and knew that he was not fooling this slicker one bit. Lucky for him that there was little co-operation between the Bureau and the more legal-minded governmental agencies!

"Well," he continued, "I was going to say, they haven't got any ethics at all. Those that paid off at all tried to hand my gyp merchandise. A bunch of them even argued in cold blood about whether to space-freeze me right away for my ship, or wait till I had a cargo."

"What stopped them?" asked Fuller.

"One of them came on the sly to ask me what life was worth."

"By the way," said Fuller chattily, "what *was* it worth?"

Ramsay stared at him coldly.

"Two hundred Bormekian neuro-vibrators and the last of my radium."

"That was very bad," murmured Fuller. "Transporting deadly weapons. Interstellar Council is touchy about that. I suppose he made himself master of at least one planet?"

"No, I had to salvage some respect, so I told on him and put in for the reward."

"Reward?"

"Most of their so-called laws are reinforced in the only way that works. They admired me for it, besides liking the chance to unload my jets."

"From what you tell me, I wonder how you escaped."

"Ah, that's where I had a light-year on them. Before their Senior Council paid off, I let my intended course leak out. I stowed away the stuff, about a thousand kilocredits' worth of *iraz* crystals, and blew off the other way."

"And then?"

"Worked back to Sol about six weeks ago, but before that I sold the crystals to a Bormekian who had been around Kosor. He told me the story was all through their system, how the smart boys had missed the Terran. Said I was the only alien in forty of their years to get out with more then he took in."

Before the Bureau man could answer, his visor chimed.

"Send them right in," he said after listening to the message. "Here they are," he added to Ramsay.

The door was opened by the same unobstrusive young man who had brought Ramsay. He ushered in the visitors and discreetly withdrew as Fuller rose to greet them. Ramsay saw the B.S.T. man start to thrust out his hand, then pull it back in confusion as he sighted the tentacles.

The Kosorians walked steadily on three tapering extremities which functioned similarly to human legs; but the other triad of tentacles, corresponding to arms, seemed less

natural because they grew from a base at the top of the Kosorian.

The spaceman enjoyed the look on Fuller's face as the man scanned the dull greenish, cylindrical bodies and the gleaming metallic clothing and decorations for something at which he could talk. Finally, he realized that there was no single "head." Under each of the upper tentacles was a collection of sensory and feeding organs: eyestalks, mandibles, auditory tympanna, and others more puzzling.

"You only see the half of it," murmured Ramsay. "They breath through their skins."

"Oxygen, of course? Warm-blooded?"

"Oh, yes. But cold-hearted."

"Well, tell them that I am honored to welcome them to the Terran Bureau of Special Trading."

Ramsay put the welcome into as flowery and formal a Kosorian as he could remember. He introduced Fuller as a person of considerable importance—which he suspected might be true and which the Kosorians, with what they considered good manners, were the first to admit. One of them thrust out two eyes and scrutinized Ramsay carefully.

"All Terrans look alike," it hissed from its nearest speaking orifice, "but I sense you are familiar."

"You do?" said Ramsay.

"Sssssh!" It was an exclamation of wonder, not a request for silence. "I feel the truth. You were on Kosor IV. During Maoog's rebellion."

The other two waved eyes toward the speaker.

"This is the Terran which sneaked off with the reward."

Every tentacle in the room twitched like the tail of an irritated cat, slapping against the cylindrical bodies in a Kosorian paroxysm of amusement.

"I am Evash," the speaker informed Ramsay. "My companions are Ozul Nath and Viska Piljoog. We are deeply honored to meet one of your sagacity."

"What is it saying?" demanded Fuller.

"They admire me for my past," said Ramsay. "What do you want me to tell them?"

Fuller instantly became the perfect host. Ramsay interpreted the Bureau's arrangements for the ferrying of freight from the orbit about Lunar, into which the Kosorian ship had been ordered. He expressed in several different ways the Bureau's desire to make their visit pleasant, and the hope that it would lead to mutually profitable trade relations. He explained about the Bureau's hotel for interstellar travelers, and mentioned that all rooms in the oxygen wing could be regulated for temperature, pressure, and oxygen content.

Evash protested that the Terrans' hospitality was exceeded only by their wisdom, and asked when he and his friends might see this hotel.

Fuller beamed when this was translated.

"Why, take them down now, in a Bureau aircar. Here—I'll give you a B.S.T. identocard. I'll countersign it—and you stamp your thumbprint in the corner. Now, anybody will accept your signature and send us the bill."

"How high can I go?" inquired Ramsay prudently.

"Why, I don't know." Fuller stared in surprise. "I doubt that one man could dent the Bureau's budget. Want a few kilocredits for petty cash?"

"Better not," said the spaceman. "I'd have my pocket picked by these accessories in half an hour."

"Here! Take one 'kill' anyhow. If it makes them happy to steal, that serves our purpose also."

Ramsay shrugged, pocketed the roll of bills, and took his leave. He escorted the Kosorians to the hotel in an aircar placed at his disposal by Fuller. Since they were oxygen breathers, he was able to help them to check in and to see them to their suite on the second floor. He promised to return next morning when the B.S.T. had made landing arrangements for them.

Leaving, he was stopped in the lobby by a sad clerk. The man was accompanied by a mechanical monstrosity housing a chlorine-breathing citizen of Vozaal VII.

"Beg pardon, sir," said the harassed clerk, "but are you the gentleman with the Kosorians—I believe that is the name?"

"That's right," said Ramsay, pulling out his identocard.

"Oh, I see, sir. Honored, indeed. But this . . . ah . . . gentleman in the rather crude vacuum suit wished to inquire about them."

He turned to the metallic bulk, which exchanged a series of whistles with him. The alien turned and lumbered away.

The clerk managed a rueful gesture with one eyebrow.

"He says he wants a special locking device on his air lock, and all his valuables in the hotel safe. He also served notice that he intends to keep a weapon in his room."

"Good idea," agreed Ramsay cheerfully. "Met them before, did he?"

He went out, leaving the gloomy man to his worry.

Having returned to the Bureau in the aircar, he discovered that Fuller had plans for him that did not include a free evening. The chief slicker had a pair of assistants and some weird apparatus gathered in a room adjoining his office.

"You are going to give me lessons in Kosorian," he told Ramsay.

"Now?" yelped the latter.

"It will only take an evening, with hypnosis and sleep recordings made while you talk to me about the language."

"But—"

"Oh, I know I am being inconsiderate after your long time in space, but your fee will be generous. You

do want to co-operate, do you not?"

"Oh, sure, I don't mind," said Ramsay, thinking of the Fegashite dysenine. "What shall I start with?"

The next morning, Tom Ramsay went directly to the B.S.T. hotel. Fuller had promised to have an air-car with a permanently assigned chauffeur meet him there. During their brief morning television talk, Fuller had explained the arrangements.

The Kosorians had been assigned a warehouse in the hundred mile long coastal landing area south of the city. The Bureau had announced the event to certain buyers, among whom it had planted its own eyes and ears. Ramsay was to escort the Kosorians there to meet the others of their crew accompanying the cargo, and was to watch for anything suspicious.

That was about the way Ramsay understood it. He was a trifle hazy on details, since Fuller had insisted upon practicing the sort of pidgin-Kosorian he had acquired by the partnership of Ramsay and science. The spaceman felt that the slicker's accent was not beyond reproach.

He was surprised to find his charges waiting for him in the empty lobby.

"We have been exploring the resources of this building," Evash hissed in reply to his question. "There were some methods of estimating the results of chance."

"Methods of—Oh! The gambling room. Yes, it's designed to duplicate the favorite games of our visitors."

"It occurred to us," whooshed Ozul, "that they were arranged very courteously to be generous toward the guests."

"Oh?" said Ramsay, thinking that the Bureau had better be slicker with its tricks for making visitors happy.

"Please do not think us displeased," Evash begged him. "It is merely that after we had obtained a large sum of your money . . . was it over a hundred kilocredits, Viska?"

Ramsay gulped.

"At any rate," Evash continued, "you can understand how the attraction faded. Especially since we found we knew certain methods of influencing some of the games."

The skin prickled all over Ramsay's body. The wad of Fuller's money felt like a planetoid of negative matter in his pocket.

"You mean," he whispered, "that you can win—*anytime?*"

The Kosorian tentacles twitched in amusement.

"I can feel your thoughts like the rays of Kosor on the airless first planet," said Evash. "Unfortunately, they will not allow us to return."

"What!"

"We permitted some of the non-Terran guests to instruct us in their own games," explained Ozul. *"Ssssh!"*

"They thought they were cheat-

ing us," added Viska, his tentacles curling at the tips almost into knots.

"And now," Evash hissed regretfully, only the Terrans will communicate with us at all. It must be their duty."

Cursing himself for rising to the bait, Ramsay went to inquire for the aircar Fuller had promised. He was informed that it would drop down from the parking roof in a moment. Ramsay led the Kosorians outside and looked around for it.

A husky, uniformed man, whose features suggested experience in one of the rougher sports, left an aircar with idling props and trotted over.

"Mr. Ramsay?" he asked.

"And party," added the spaceman.

"Yes, sir . . . ulp! All tails, no heads, ain't they?"

"What?"

"I'm Jack Harley. Mr. Fuller says I'm to stick with you for this job."

"Glad to have you, Jack," said Ramsay, noting mentally that this was a good pair of shoulders to have handy. "Count your money, and let's go. Know where it is?"

"Yeah. Mr. Fuller gimme a map."

They all crawled into the aircar. About a quarter of an hour later, they hovered over a long, low building beside which rested a small, local-cargo rocket. This had been brought into position for unloading on a series of undercarriages running along specially constructed tracks. As soon as Jack had landed, they alighted, Ramsay being especially relieved to do so. The machine was designed for comfort—if your companions were human.

They were admitted to the building when Ramsay flashed his B.S.T. card to the guards. The spaceman glanced down the length of the cargo shed. All the workers were Terrans, but he could see several Kosorians supervising the unloading. At the far end, one of these seemed to be comparing his own records on tape with the paper pages of a Terran clerk.

Even at a distance, it was obvious that the barrier of language prevented the least progress. Standing by was a rotund little Terran, waving his arms hysterically; but the Kosorian was by nature better equipped for such debate.

"I see that some of your friends have come," said Ramsay to his

three charges as they moved toward the scene.

"From that I sense an idea," hissed Evash. "Do I understand that the circulation of them is inhibited?"

"Inhibited— Oh. Yes, more or less. It's a formality, until or unless they have passports approved. I guess you'd call the law here a little clumsy."

"We are relieved to hear your opinion," Evash told him. "It suggests that informal alleviation may be possible."

Ramsay thought: *Here it comes! Watch out for strings, kid.* Aloud, he said:

"I'd be flattered to hear your solution."

The three Kosorians slowed their pace with such unanimity that the spaceman wondered if they possessed any unseen means of communication. He stopped to face them.

"It happens," said Ozul politely, "that we can well spare a sum of Terran currency, having more than is convenient—"

He displayed a neatly folded wad of credit bills at the tip of one tentacle.

"Oh, some of your winnings?" inquired Ramsay.

"It seemed to us," suggested Viska, "that they would be more useful to you."

"Besides," said Evash, "hardly any Terran except you could detect another Kosorian replacing one of us."

"I suppose not," said Ramsay, carelessly thrusting the currency into the pocket of his slacks. "And it seems a shame for them to miss seeing the sights."

The trio agreed enthusiastically.

"It is a flattering pleasure to have met you again," Evash concluded. "You are the one Terran who understands us."

Ramsay expressed gratitude and suggested that they investigate the dispute ahead of them. The Kosorians slithered gracefully between hustling workers and truckloads of goods to follow Ramsay. The Terran clerk withdrew pointedly, leaving the strange Kosorian and the little man thrashing air.

"Can I be of service?" asked Ramsay in Kosorian.

"Can you *talk* to it?" demanded the Terran, amazed.

"I am overjoyed to sense you," said the Kosorian, making a gesture of greeting to Ramsay's companions. "I stand in dire need of wisdom."

"Say it can't do that to me!" panted the chubby man.

Evash had turned to his crewmate and was speaking in careful Kosorian, slow enough for Ramsey to understand easily. He overheard several references to his kindness, intelligence, and importance. The Kosorian supervisor brought all possible eyes to bear upon him.

"This thing seems disturbed by some matter," it explained apologetically, "but I am too stupid to understand it."

"What's your damage?" Ramsay asked the little man.

"Name's Carter. Contracted for this entire cargo. Got priority from the B.S.T. for a special bid."

"You mean you're buying it sight unseen? Brother, the orbits shift when these boys are around!"

"Oh, I'll make a profit, all right. Ship the whole lot to one of my sector agents and let him worry. *Anything* has a market *somewhere*. Besides"—he winked—"I got a guarantee against loss."

"Well, it's your gamble."

"Not the point. *It* won't deliver everything. See that pile of cans there?"

Ramsay followed the gesture to a shoulder-high stack of sealed metal containers. The cans were cubes measuring about fifty centimeters to the edge. There were nearly a hundred.

"You refuse him part of the cargo?" he asked in Kosorian.

"Now I feel the truth," said the supervisor. "Tell it this belongs to the crew members, for private speculation, according to our custom."

"It is so," confirmed Evash. "Such would not come under the agreement. They should be presented for public bidding."

"That seems only fair," admitted Ramsay. "The public may be interested. What do the crew members usually choose?"

He idly hefted one of the cans. It was very light, not empty, but like something fluffy and bulky packed in thin metal.

"I do not know," said Evash. "Each one chooses differently. Would your Bureau care to inspect the contents?"

"Oh . . . no," said Ramsay quickly, feeling that he had shown entirely too much curiosity.

There would be nothing wrong with the first shipment; the later ones would bear watching. Or would the Kosorians have estimated his reasoning in exactly that way?

He explained as best he could to Carter.

His three Kosorians spent about an hour inspecting the facilities at their disposal and conversing with various of their companions. At length, they returned to the hotel, where Ramsay arranged for an air-car to take them on an aerial tour.

This attended to, the spaceman had Jack make a beeline for the Bureau. He was reasonably certain that a different "Viska" had returned from the warehouse.

"And you think they were not the same?" mused Fuller, when Ramsay had reported. "How much did they give you?"

Ramsay pulled the roll of credits from his pocket and began to count them. As he passed eight hundred, he hesitated. Two more hektocredit bills made one thousand.

"One kill, to be exact," he murmured.

Fuller looked at him thoughtfully. "I handed you a kilocredit for

expenses yesterday," he began, but Ramsay was already fumbling out his credit case.

He carried one of iridescent Cagsan lizard skin, supple but incredibly tough. His fingers plucked at the tiny combination lock to the large-bill compartment, but he felt that it would be empty. It was.

"Believe me," he said to Fuller, "I never noticed it out of my pocket! I don't even know how long it took them to open the lock."

"Don't worry," said Fuller. "I am beginning to believe your account of them."

He rose.

"If you will step into the next room, I have something to show you."

Ramsay silently followed him through the door.

In the next room, they found two of Fuller's assistants with a sort of outsize centipede, which Ramsay recognized as a Fegashite. This individual seemed very nervous, constantly making fluttering motions with his six pairs of limbs to smooth down the white fur of his slim, two-meter body. Like the Terrans, he had a two-eye visual system, but each wandered at will about the office, without daring to meet a human glance.

"I would like you to meet Number 840176," said Fuller.

"I thought they used names," said Ramsay.

"They do," replied Fuller genially, "until we catch them selling dysenine or other drugs around Sol."

The Fegashite twittered shrilly. One of the assistant slickers translated.

"He says you promised to overlook it in return for his co-operation."

"Perhaps I shall," murmured Fuller. "It depends upon how useful he may be."

He turned to Ramsay.

"One of the local patrol ships caught this worm negotiating with your friends."

"When?" demanded Ramsay.

"Oh, I use the term loosely. I mean their main ship, just inside Luna. The patrol picked him up after he left their orbit. They sent this weasel down to me when they found traces of the leading Fegashite export."

"Dysenine?"

"What else? And my neck hairs tell me your Kosorians have it by now. Did you see anything odd at the warehouse?"

Ramsay told his suspicions of the cans ostensibly owned by the crew. The Fegashite, apparently understanding a good deal of Terran, twittered to Fuller's assistant.

"He says he sold it to them in plastic bags," translated the man. "In powder form, you know, that light stuff."

"Yes, I know," agreed Ramsay.

"I imagine you do," said Fuller. "Were those cans light enough?"

"Yes," said Ramsay, with bitter simplicity.

"Well," said Fuller, "I shall just have to get the Bureau on the job."

They returned to the B.S.T. man's own office, where, at his request, Ramsay put through a telecall to the Kosorians. He located them in the aircar supplied by the hotel and arranged an appointment with Fuller upon their return.

That gentleman dismissed him for the rest of the day, seeming confident of his ability to make himself understood in Kosorian.

"At least on the fundamentals," he muttered viciously as Ramsay left.

Some time later, Ramsay's dinner was interrupted by a call from the Bureau. Judging from the background on the visor, Fuller was in his own office.

"We came to an understanding," he informed Ramsay. "They had a little deal with a Terran who shall remain nameless—to you. Some of my colleagues will be so happy to lay hands on him that I offered your octopi chum their expected profit if they would let us deliver the goods."

"They admit what it is?" asked the spaceman.

"They appear to be without a sense of shame. The B.S.T. will, of course, arrange for the Narcotics Department to confiscate the dysenine immediately, so no harm will be done. I demanded only one condition from the Kosorians, and they promised to bring the small amount of dysenine they held out to my office tonight."

"Have them watched," recommended Ramsay.

Fuller clucked reprovingly.

"My dear boy!" he exclaimed.

"Will they stay long?" asked Ramsay, to change the subject.

"The Bureau has already transferred their credit to Luna, where a cargo was got together for them. They are loading now from Luna, at the same time we are clearing up the details of their cargo here."

"That's nice," said Ramsay.

"Quite. Drop in to see me tomorrow morning."

Ramsay agreed, cut off, and began to plan an evening. The next morning, but not too early, he entered Fuller's office. Taking a chair at the other's languid gesture, he noticed that the B.S.T. man did not seem as alertly self-possessed as usual.

"Trouble?" asked Ramsay, crossing his long legs.

A slight frown creased Fuller's brow.

"I am not sure," he said.

Ramsay waited for further revelation.

"What I should say, I suppose, is that I cannot quite remember."

"Can't remember what?" asked Ramsay.

Fuller threw him a disgusted glare. He opened his mouth for what Ramsay expected to be a cutting answer, but the chime of his desk visor sounded.

"Fuller here," he answered. "Astro Department? Well . . . not exactly alone—"

He glanced thoughtfully at Ramsay.

The spaceman raised one eyebrow and gestured toward the door, but the other shook his head.

"Does it concern my Kosorian case?" he asked the visor.

There was an instant of silence, then Ramsay heard a murmur from the instrument. A pretty slick arrangement, he thought, the screen turned away from visitors and the sound directionalized as well.

Fuller made a wry face. Without a word, he nodded to the unseen caller and flipped the switch.

"Now I remember," he told Ramsay grimly.

"What is it?"

"Yesterday," said Fuller, slumping forward dejectedly, "in the evening, after I called you, our three friends returned."

"To give up the dysenine they still had?"

"That is what I thought. They began to lead up to it in that flattering fashion of theirs. I forget which one went so far as to put his 'arm' around my shoulder, but after that things seemed different."

"What do you mean?"

"It is very difficult to visualize. I must have been instructed to forget, but I think it felt a little like hypnosis. I seemed to understand their speech better, but I do not remember having a single original thought after that."

"They must have slipped you a touch of dysenine," said Ramsay. "Did you lose track of time? Were all your other senses very alert, especially about physical movements?"

"Yes," said Fuller. "Perhaps those are the associations which help me to remember, now that something has reminded me. To be as brief as possible:

"Somehow, I began to feel that it would be a good thing to show them the astro-intelligence section. I think that was after they expressed interest in that wall map outside. It was after hours, but my badge got us past what I had always considered the perfect mechanical watchman device."

"What kind of a place is it?" asked Ramsay.

"The secret file room is where we wound up, I think. I feel that we were in there only a few seconds, but that may be the effect of the drug. I have a picture in mind of one of those snakes holding a length of film."

"You mean they keep the files on microfilm?"

"Yes, and that must be what made me remember just now. That call was a general alert, the routine procedure when something important is mislaid. They are missing a sixteen millimeter film strip, which holds complete data, especially location, about a whole group of little-known star systems."

"Something—profitable?"

"Unimaginably."

"Do they know about the Kosorians, in the other section?"

"Not yet, apparently," groaned

Fuller. "As soon as they learn, I shall be on a curve for the Edge."

There were a few silent minutes while they thought it over.

"Probably," said Ramsay, "they didn't expect you ever to catch on. Dysenine effects aren't quite as complete on Terrans as on most people."

"I wonder," mused Fuller with a wicked expression creeping across his features, "what is effective on Kosorians."

"I don't know," said Ramsay. "They never told me."

Fuller reached out to turn on his visor.

"We'll soon find out," he promised.

In the next half hour, Ramsay was treated to a glimpse of the resources behind a B.S.T. representative. Fuller consulted with and gave assignments to chemists, mathematicians, local police, psychologists, news broadcasters, transportation experts, biologists—Ramsay lost track. The Bureau seemed to have contacts in any given organization. Occasionally, questions were asked, but never any beginning with "why."

"That might do it," sighed Fuller finally, leaning back and smoothing his blond mustache with one finger. "As soon as the chemists come through, our friends will get their emergency notice—I suppose it will be 'one of our devastating Terran hurricanes,' or some such thing. At least, it will require them to clear out for their safety."

"Taking their secrets with them?"

"Attempting to, I trust," answered Fuller complacently. "We shall be unsuspecting and completely co-operative. You will be sent to escort them to their assigned rocket and to cut all red tape concerning their departure."

"How will that get your microfilm back?"

"I hope that you will be able to go to the hotel with something really potent in your pocket. When you damp their jets with that, we shall have a battalion in there to search every scrap they intend to take with them. Before they realize what curve they are on, they will be in space."

"Sounds good," said Ramsay, "but I hope you don't underestimate them."

"I hardly dare think of that," said Fuller.

Just then, his visor announced a caller.

At Fuller's response, a man in a laboratory smock scurried into the office. He left the door open behind him, using both hands to cup a small, fragile object.

"Meyers, Chem," he introduced himself tersely. "O'Brien says this may work."

"What is it?" asked Fuller.

"We looked up everything there is about all life forms like what you described. O'Brien picked out four or five of the most sure-shot freezers the Bureau knows. Then we blended them into a solution and sealed a small quantity in this vial.

Break that, and you'll have a gas immediately."

He nearly drooled with pride. Ramsay was still hoping it was really that good when he reached the hotel about an hour later. He had a room number to call when he was ready for Fuller's crew. To avoid attention even in the oxygen wing, they were all to be non-Terran.

He let Jack take the aircar up to the parking roof, after warning him to expect anything. Then he went inside and headed for the elevator. Four scaly Centaurians crowded into the car ahead of him, however, and favored him with a quartet of chilly, reptilian stares.

"Must know who I came to see," reflected Ramsay, deciding that he preferred the stairs.

It was only one flight up. He reached the door quickly enough, but paused outside to ease the little vial in his breast pocket. Then he pressed the button which would announce his presence with a musical note and an image on an interior screen.

The door opened in a moment, and he was greeted by Evash. The Kosorian gestured hospitably with one tentacle, and Ramsay stepped in.

He stepped into the tentacle, which neatly completed the welcoming gesture by whipping two turns around his neck. Another steely grip encircled his waist and he was jerked off his feet. He heard the door slam behind him. Then he felt a sharp prick at the nape of his neck. Evash held him in midair for

. . . for—Ramsay could not tell how long.

He discovered himself standing again. He was slightly off balance to the left, supported by a Kosorian tentacle. With weird slowness, two other Kosorians progressed into his field of view. Feeling that he was making a poor showing, the spaceman tried to straighten up. He was immediately aware that he had overdone it and was falling to his right. He felt the muscles in his right foot, ankle, and leg straining to correct, but realized they would be too slow. Every other muscle in his body struggled to move left. He regretted that he did not have better control over a particular set in the left small of his back.

Then Evash wrapped a tentacle around the Terran's head and supplied the missing ounce of balance. Simultaneously, the surrounding action speeded up drastically.

"Whatllwedowithm?" hissed Evash.

The other two answered. Ramsay tried to decide whether they took turns or talked together. He seemed to get the first word or so of every sentence. This code was too fast for him, he thought.

"Came . . . coincidence—"

"Feel untruth—"

"Search—"

"Convenient . . . use . . . ship—"

"Aircar—"

"Chauffeur . . . easy—"

"Perfect . . . go—"

"Downstairs . . . go downstairs . . . go . . . with . . . us . . . downstairs . . . go . . . with . . . us—"

Ramsay found himself walking through the door in a web of tentacles. With every step, he was amazed anew that he succeeded in performing the complicated maneuver of moving forward a leg to catch himself as he started to fall.

"Act . . . normal . . . act . . . normal . . . act . . . normal—"

Ramsey noticed that he was plunging furiously down the stairs. The thick carpet at the bottom rushed up at him like the surface of Stegath II the time he had crashed a landing rocket. He almost screamed as a bolt of fear flickered throughout his nervous system.

"Hold back!" he told himself, but the tentacles seemed to shove him along.

In the small of his back, a pore oozed a drop of sweat. Then two on his forehead, and several in his armpits. He was drowning in his own perspiration and heading for a smash at the foot of the stairs.

"Gotta adjust," he thought frantically.

He had been thinking that for hours, but now there was something more important he must do. A voice from somewhere was telling him—

Halfway to the door, he realized he had spoken to the desk clerk, as someone had suggested. A second later, they were outside. Ramsay cursed silently and furiously to try to snap himself out of it. They were getting away and no one

seemed to notice anything wrong. Where were all of Fuller's agents?

"Called your aircar at the desk," Evash explained to him. "Pick us up here."

The Kosorian spoke more slowly. No, Ramsay had adjusted again. Everything was slow. He seemed aware of each individual muscle in his body. Staring ahead, he saw the shadow of the descending aircar, and took about a year to think things over while it reached them.

This is the blast off, he thought. *I'll tip Jack off somehow. They won't get any farther.*

They had taken him with commendable neatness. A dysenine needle in the neck. He was theirs. Not a move without suggestion. But he must! Who was to offer him suggestions except the Kosorians? He was lucky to be able to think at all. Probably they had been afraid of killing him, not realizing that Terrans could stand more than most beings thought at first glance.

He must concentrate on letting Jack know. Not too openly, lest his captors notice. Just plainly enough to show something was wrong.

The aircar settled lightly in front of them. As suggested, Ramsay drawled through the explanation that he himself would pilot their guests to the rocket, to spare red tape. The chauffeur need not bother. He watched Jack's features radiate surprise, disbelief, thought, acceptance, suspicion. The man had blinked.

The Kosorians began to creep into the aircar. Ramsay estimated the odds for six different courses of action on Jack's part, ranging from taking the day off to reporting immediately to Fuller that something was wrong. For himself, he knew he was perfectly capable of dashing inside to the desk, calling the B.S.T., dictating a complete report, and rushing back in time to close the door after the last Kosorian.

But somewhere between the decision and the physical action lay a cold, dead, inert vacuum. Instead, he got in.

"Take us up!" suggested Evash.

Ramsay took the aircar up, yearning all the while for enough control to squeeze the vial in his pocket. He wanted almost as badly to look down and see what Jack was doing. Instead he stared directly at the instrument panel.

"Not so fast," advised Evash.

Ramsay slowed the machine until it seemed to him that they must plummet out of the sky. He counted the revolutions of the overhead rotor from its shadow on the hood, wishing he had the drive to look up at it.

Tom, my boy, he told himself, *no use kidding yourself. You can't break out of this. You'll have to use it against them—like judo, where you use the other guy's strength.*

The Kosorians had him head south, toward the warehouse where the rocket was waiting. He only had a few minutes.

It had to be soon. Some way to

avoid doing exactly as they told him. Deliberately misunderstand—no, he must not think that, even if he meant it. Keep it at the back of his mind. Way back. Do exactly as they said, and maybe make up his mind in the middle of doing it.

He must plan . . . something . . . but convince himself that he was not planning rebellion. Must forget that word. Keep his real intentions submerged. Do what they said.

"What is our Terran thinking?" inquired Evash.

"I must do as you wish," answered Ramsay promptly.

"Very good," approved Evash. "Down toward the warehouse."

Ramsay considered the order. "Down toward the warehouse." That was too simple to be ambiguous at all. He glided down. If only he could muster the initiative to lean forward against the wheel and smash the vial! He would get no opportunity to twist their words. He had been a fool to think he would. He strained with every ounce of determination he had to lean forward.

Nothing. He did not even break into a sweat as he had imagined he would. Meanwhile the aircar had swooped near the building, where the rocket waited.

"Land by the ship, like a good little Terran," said Evash sarcastically.

Ramsay gave thorough consideration to the Kosorian's figure of speech, in both languages. He decided that its translated equivalent indicated a Terran child of about a six-year intelligence. Obediently, he slammed the aircar toward the ground with probably the most accurate imitation ever conceived of a six-year-old's skill!

"No, no! Up again!" shrieked Evash frantically.

The aircar smacked against the ground and jolted along for several yards before Ramsay's reflexes obeyed the order to rise. There were a number of dull, thudding blows in the rear as the Kosorians thrashed about with terrified tentacles. Ramsay tried to push himself away from the wheel, against which he had been slapped like a wet rag. He was aware of a sharp stinging in his chest as he reached out to the controls.

"What was I going to do?" he wondered. "Oh, yes, go up."

The aircar rose straight up, its interior quite silent.

Good thing they build them right, thought Ramsay. *Not fragile like—Say! What is that? Yeow!*

He had discovered the pungent smell in the aircar. Also, he was aware that he had made up his own mind about it.

"Maybe I can even turn my head," he thought happily.

He could. It made him feel very gay. The three Kosorians were a tangled mass in the rear, completely relaxed. It seemed very funny. He began to chuckle, then to laugh.

Ramsay guffawed at the top of his lungs all the while he calmly and

coldly considered whether he would have time for what was necessary.

About fifteen minutes later, he was still snickering as he crawled again into the front seat.

"I'll kick that O'Brien onto a curve for the Edge," he vowed as he began to hiccup. "What did he put in it anyway? Laughing gas? What a mixture I have in me by now!"

He had not been as lightning fast as the dysenine had led him to imagine; but, in the end, two small strips of film had come to light in a hollow ornament on one of Ozul's tentacles.

Ramsay tucked these into his boot and headed for the warehouse. His landing, beside the building, in front of the rocket, was only slightly drunken, but he expected the guards to remember his earlier try. Surprised when no one molested him, he looked around as he opened a few windows. He saw Jack peering at him from the darkness of an open doorway.

Ramsay beckoned, and the chauffeur sprinted out to him.

"Under control, sir?" he panted.

"Just about," said Ramsay. "Am I glad to see you!"

"I called Mr. Fuller right after you left. We been on your tail one way or t'other ever since."

"Good," said Ramsay, pulling the film strips from his boot. "Here, grab these and clear out fast. Tell them to act around here as if nothing happened."

Jack scorched a trail back to the building. Ramsay, after glancing at the Kosorians, quickly checked his cash and identocard. As soon as he saw another aircar rise from behind the rocket and speed off to the north, he leaned forward over the wheel, head in arms. When they came to, so would he.

Later, he watched Fuller's eyes gleam as the B.S.T. man poured a pair of drinks.

"Did they know?" he asked Ramsay.

"I doubt it," said the spaceman. "I don't think they knew any better than I did exactly how long we were up. We exchanged compliments before they went aboard the rocket."

"What did they have to say?"

"Oh, their usual line. They hated to part from me, but hoped to make a better profit at their next stop, since they would surely have less brilliant people to deal with."

"What did you tell them?"

"Said I'd never dream of being on Terra the next time they came, because I don't have the brains to keep up with them. They hoped so, as they wouldn't dare try any sharp deals if I were. Anyway, they had some other places in mind."

"Other places," mused Fuller. "That sounds good. Those were the films, but do you think they will figure it out?"

"Sure," said Ramsay. "Evash will come back to the time he can't remember between landing and getting out. He'll catch on. That's what I'm enjoying!"

"That leaves only one or two de-

tails," said Fuller. "I intend to stretch a point because you have been of considerable assistance."

"What?" asked Ramsay.

"That ten pounds of dysenine you had—very clever to have it crystallized to look like cheap jewelry. One of our men checked your quarters. Routine, you know."

Ramsay had visions of being dismissed with no other wages than this "favor" he had not known he needed.

"Listen," he said, "was the stuff hard to find? Or was it practically in plain sight? It sounds like something Evash would have thought was funny."

Fuller reflected. He nodded slowly.

"I dare say that was it," he said. "Well, the Bureau will send a suitable fee around to your hotel tomorrow. I intend to include my own little letter of recommendation. You will be surprised how much help it will be—in the most unexpected places."

"I can imagine," grinned Ramsay.

"You think you can!" said Fuller. "Sorry, I shall have to have back the identocard. It gives its bearer *carte blanche,* and might prove embarrassing to us."

"Sure," said Ramsay, reaching for his credit folder.

He noticed that Fuller refrained from questioning the thick stack of credits he removed to look for the card. The Bureau was not niggardly, whatever its slick practices. He should have the card by now; there did not seem to be any more compartments in which to look.

"Do you mean to tell me—?" began Fuller, choking.

Ramsay's shoulders drooped. He nodded sadly.

Fuller sat motionless for several moments. The spaceman thought his complexion darkened some. His expression froze.

Then, with perfectly bland features, Fuller reached out for the glass from which he had been drinking. He raised it shoulder-high and hurled it against the far wall of the office. Ramsay ducked instinctively as the splinters flew.

The Bureau man drew a long breath. He smoothed down his mustache with a trembling finger.

"Oh, well," he sighed, "they're gone!"

THE END.

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ELECTRONICS—NEW STYLE

BY E. M. LOCKE

***The** vacuum tube and electronics have been practically synonymous for years. That electronics can exist as a science outside of a well-pumped vacuum, however, is a relatively old fact—and a very new development!*

Robert Heinlein, in his story "Universe," described the machinery of the starship *Vanguard* as operating on a submolar level, thus cheating friction and wear of their customary toll. It is fair to infer that Heinlein was expressing his dissatisfaction with the general crudity of much of today's machinery and suggesting that by the use of atomic phenomena the various functions desired could be obtained in a more elegant as well as a more satisfactory way.

Of course, dissatisfaction with the means available has been the driving force behind the growth of technology and hence it is not a new feeling that Heinlein was reflecting. Progress is being made steadily. Witness, for instance, the way in which the art of communications has advanced in the last one hundred fifty years. In the early 1800s if a message had to be transmitted, a human carrier was necessary. Today the carrier is an electromagnetic wave, whether traveling over wires or in a beam or in a nondirectional broadcast wave.

In the field of power generation the progress, though great, has been less striking. While it is a long step from muscle power to the turbo generator there is something aesthetically unsatisfactory about the whole business. We are still dependent on a complicated and crude method of utilizing chemical fuels. There is also entirely too much gross mechanical motion involved despite widespread electrification. The only element in the chain that is satisfactory is the power transformer, working silently and very efficiently.

But what about atomic energy? Isn't it atomic phenomena with a vengeance? Well, as John Campbell has repeatedly pointed out all we are doing here is substituting one kind of fuel for another. The process

of power generation is still as cumbersome as ever. In fact until someone shows us how to convert atomic energy directly into electricity our ideal will not have been satisfied. Today it is only too true that the only sub-branches of Applied Atomics are element transmutation and slum clearance.

One could go on indefinitely and point out the deficiencies of existing means for the doing of anything you might care to name. If you are optimistically inclined, you might point to electronics as not involving gross motions and friction. This is true but there is a difficulty. Today's devices require extremely elaborate fabrication processes and are susceptible to trouble, wear and eventual failure. Electronics is fine stuff but it will become much finer when the equipment can be made simple and will go on working indefinitely.

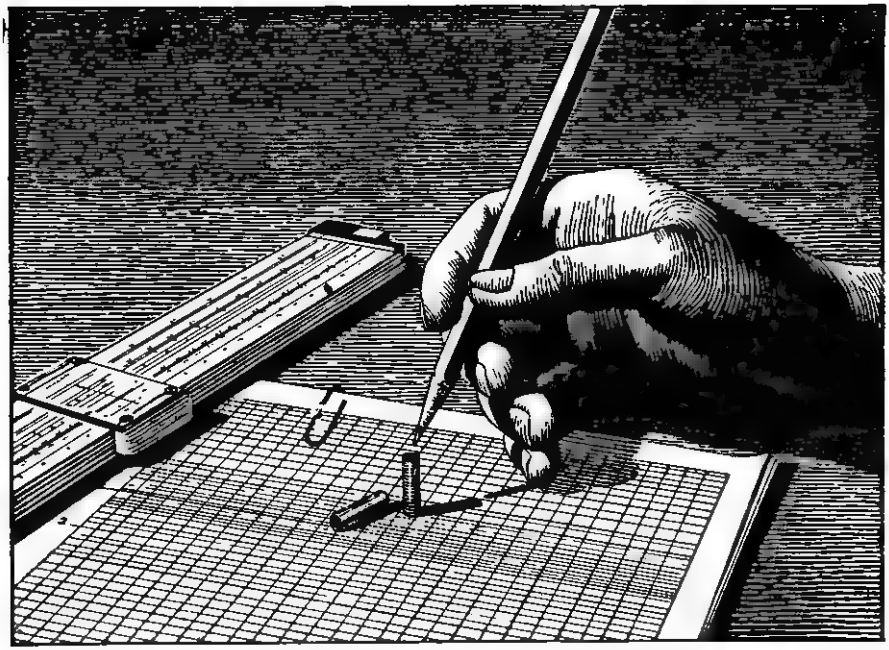
Now all this may sound like wishing for the moon. If electronics does not meet our ideals, what will? Well, if we eliminate an unconscious semantic block, which causes us to identify electronics with the devices in current use, then the answer is still electronics but with the new look.

Unless you have been following the new but rapidly growing field of Applied Quantum Physics, it will probably come as a surprise that the new electronics has already arrived. Because its applications have been made mainly in communications, this article will deal mostly with examples taken from this field. Radio is typical and familiar to all so let us use it as the background.

In every communications system we start with the oscillator. This is true even in speech, the larynx being the oscillator in this case. In radio work the conventional electron tube takes care of this job quite well up to say three hundred megacycles and beyond this the klystron and the magnetron take over. The latter can generate centimeter waves with lots of power as its use in radar has proved. It is the availability of these new devices that has permitted the exploitation of the advantages offered by these ultra-short waves.

As anyone who has worked with oscillators knows, they have one besetting trouble; they will not hold their tuning but drift off due to various causes. For this reason they are stabilized to meet the exacting requirements of communications work. This problem was solved at the longer wave lengths by coupling the oscillator to a quartz crystal. The natural frequency of oscillation of a properly cut crystal is very stable and the resonance is very sharp. Thus, when an oscillator is suitably associated with the crystal, the oscillator finds that its job is much easier if the current it has to push through the crystal has a frequency coinciding with the crystal's resonance frequency. Thus the device is forced to be stable.

Something of this sort was badly needed in the microwave art. Crystals could not be used because their



The pencil points to a transistor—the newest and perhaps most important of all recent non-vacuum electronic devices. Its tiny size, indefinite life, and immense ruggedness make it extremely promising.

dimensions would be too minute, say of the order of 1/100,000th of an inch. The equivalent of quartz for the centimeter band was found only recently. Of all things, it turned out to be a tubeful of ammonia gas! The frequency stabilization was achieved by tying the oscillator to one of the spectrum lines of the gas. To see how this trick was done let us cast a brief glance at the physics of radiation. The description about to follow is not intended to be precise, merely suggestive. A more exact statement would require a great deal more exposition than is possible to give here.

If an atom absorbs a quantum of energy, it will sooner or later return this energy by re-radiating it in the form of an electromagnetic wave. It does this because the electron shells around the nucleus are in an equilibrium condition which is upset by the impinging energy. This causes the shells to vibrate at one of the characteristic frequencies, much like a struck bar will radiate sound when its equilibrium is upset by the blow. In a large group of

atoms the individual atoms possess differing amounts of energy and to each of these energy states there is a corresponding configuration of electrons and vibration frequency. Consequently, an aggregation of atoms is capable of vibrating at many frequencies and does so under the right conditions. This is what gives rise to the observed spectrum of an element.

In the case of a molecule, the situation is quite similar but, if anything, more complicated. This is due to the fact that the atomic structure of the individual molecule can execute many types of vibrations. Since the atom is much heavier than the electron, the frequencies of vibration are much lower. In the case of ammonia—the gas, NH_3, not the household solution—a large group of these frequencies lie in the microwave region.

As a matter of fact, the stabilization of oscillators is based on the use of the absorption spectrum and not on the emission spectrum. It is known that the structure of this particular molecule is pyramidal, the three hydrogens forming the base and the nitrogen atom the vertex. One of the possible motions of this structure is for the nitrogen atom to plunge through the base of the triangle, thus inverting the structure. This it can do at a large number of frequencies in the region between twenty thousand and twenty-six thousand megacycles.

This is an energy absorbing process. If we take a metal tube—wave guide—and fill it with this gas at an appropriate pressure and then send an electromagnetic wave down the tube, a large fraction of its energy will be absorbed if the wave frequency coincides with one of these natural frequencies. If the wave frequency is now slightly altered, the absorption will be materially decreased. For instance at the right pressure the energy absorption is halved if the frequency of the applied wave is increased or decreased by as little as one part in two hundred fifty thousand. In circuit parlance the "Q" of the circuit is 125,000. This is about the same as for quartz. By contrast electrical resonators of the cavity type have a Q of 10,000 while the inductors used at long wave lengths run from, say, twenty-five to four hundred.

If part of the output of the oscillator is sent into such a wave guide and the unabsorbed energy appearing at the far end is reapplied to the oscillator in a suitable form, we can arrange matters so that a large amount of returned energy will cause a large shift in the frequency generated -et cetera. The direction of the frequency shift is made to depend on the phase of the returned voltage in such a way that the returned energy is minimized. In a way, it is much like the automatic volume control on radio sets except that it is the frequency, not the volume, that is being controlled. Since the spectrum frequency is quite insensitive to ordinary temperature variations the frequency

generated is very stable. By locking the receiver as well as the transmitter to the same spectrum line, reception may be had that is not disturbed by frequency shifts at either end.

At this point a couple of pertinent questions may be asked. The line is sharp but why is it not infinitely sharp? We think of atomic spectra as being so, don't we? The answer to this is that atomic spectra are also diffuse but we lack the resolving power to show this up. In the case of the molecules the broadening of the line is caused by molecular collisions which interrupt the absorption process. The number of collisions per second is proportional to the gas pressure and the effect may be reduced by reducing the pressure until the mean free path of the molecule is that of the narrow dimension of the wave guide. At this point collision of the molecules with the walls takes over as the controlling factor.

The other question relates to the number of such frequencies available for use. For practical communications a great many are needed and the number supplied by ammonia is far too few. The question is quite a troublesome one. It appears however that other gases exist with frequencies in the region of interest and these are now being studied.

Earlier we have mentioned that part of the emission spectrum lies in the microwave region. This suggests that it may be possible to replace our oscillators by a tank of gas. As a matter of fact such waves have been detected and measured. The only trouble is that the power available is microscopic. The waves arise from the thermal motion of the molecules causing collisions which in turn cause the molecules to radiate. The energy involved in such transfers is very small. To get practical amounts would require gas temperatures of about ten thousand degrees Centigrade. At this temperature the heavy molecules required to give us these "low" frequencies are thoroughly dissociated and so there you are.

Turning now to the radio receiver, we note that it incorporates three basic functions. The first is that of tuning or selection of the desired message. The second is the stripping away of the inaudible electromagnetic carrier from the message. This is called demodulation or detection. The third function is the conversion of the message into audible or visible form.

What about amplification? In a strict sense this is an adjunct and not an essential function as the reception of long distance signals in the early days of wireless telegraphy has shown. In a practical sense it is, of course, supremely important. The modern radio set is built around the electron tube. There it amplifies the weak incoming signal, detects it and finally, raises the level of the audio signal to loudspeaker level. Nevertheless, it now appears that the vacuum tube and its adjuncts

may be on the way out and replaced by devices using atomic phenomena. All of the functions described, as well as amplification, have been performed by crystalline structures of one sort or another. Even the television picture tube, the kinescope, is replaceable. This will probably be at a profit to our national eyesight since the crystal type device will let you enjoy motion picture screen size images if you like.

When will such sets be available? That is next to impossible to predict. The important thing to note is that each and every element required is at hand and all of them have passed the first experimental stage.

Let us start with the oldest member of the crystal family, the crystal detector. In the early '20s the standard receiver consisted of a loose coupler feeding a crystal detector and the sound source was a pair of earphones. To be sure, there were vacuum tubes but they were for the fabulously wealthy who could spend six dollars and fifty cents for a 200 or 201 type *plus* another five dollars for a storage battery. The rest of us had to be content with a galena crystal which, since it seldom had more than one sensitive spot, was outrageously overpriced at twenty-five cents.

In the course of time vacuum tubes got better and cheaper and the crystal detector became only a source of nostalgic memories to old-timers. Yet here we are in 1948 and the crystal is firmly in the saddle again. Its astonishing renaissance is due to the microwave art. When experimenters started using one hundred centimeter waves they discovered to their sorrow that electron tubes had some annoying shortcomings. The two outstanding difficulties were those caused by interelectrode capacities and by the electron transit time. In the former case the minute condensers formed by the physical elements inside the tube offered such easy external paths to the flow of currents that the amplifying element had nothing left to work on. The second effect comes roughly to this: When the electrons are being accelerated from the cathode to the plate they are still moving slowly while passing through the grid. Hence there is time for several cycles of the alternating field at the grid to act on them. The pushes and the pulls cancel out and the electron stream does not get modulated, or what is the same thing, there is no amplification.

Since tubes still work very well at thirty or even sixty megacycles the suggestion was made that the received signal be mixed with the output of the local oscillator and translated down to some convenient frequency, amplified by conventional means and then detected. The use of a crystal as the mixer element was attractive because they are free from transit time effects and because of their small size have a negligible capacitance. A search was therefore made for crystals that would be free from the defects of the early detectors. After a considerable

amount of work crystals of silicon and germanium were brought to such a pitch of perfection that they were uniformly sensitive over their entire surface. The "cat's-whisker" could then be permanently fastened in place and the unit sealed in. Thereafter they could be expected to work indefinitely over the widely varying and generally adverse conditions that attach to military use. The units were interchangeable which was of great value in radar operation. The enormous number that were so used is not generally appreciated. One manufacturer alone was turning them out at the rate of fifty thousand a month toward the latter part of 1944. Not only was this large production achieved but a steady improvement was made in their characteristics, the 1945 product being fifty times better than the 1941 product. In view of their compactness, sensitivity, low capacitance, freedom from aging and low power consumption they are now finding applications at low as well as high frequencies.

One such interesting application is to high speed switching. The reason why the crystal works as a mixer or as a switch is that it conducts enormously better in one direction than in the other. A rectification ratio of ten thousand to one is not at all unusual. This means that in one direction it acts almost like a direct connection while in the other it is like an opened switch. High speed crystal switches are planned for the M.I.T. electronic computer where they will serve to automatically set up the necessary transmission paths between the various organs of the machine.

Turning now to selective circuits, up until rather recent times these were comprised of inductances and capacitors in combinations of varying degrees of complexity. To understand the defects of this system and the merits of the crystal approach consider the simplest selective circuit, one inductance in series with a condenser. For a wave of a particular frequency there exists a certain relative proportioning of the two elements which permits the maximum flow of current through the pair. This is the condition called resonance. If the frequency is changed slightly, the current flow is decreased. The less change of frequency it takes to produce a given decrease in current, the more sharply tuned the circuit is said to be.

It turns out that because of the energy losses in the coil, such circuits are not particularly selective. About twenty years ago it was realized that the properties that made quartz crystals so useful for oscillator stabilization were the ones that could produce very sharply selective circuits. The reason why a mechanical body like a crystal can be made to act like an electrical resonant circuit is because this crystal is piezoelectric. This means that, when a voltage is applied across the crystal, its dimensions will change

slightly and conversely, if it is deformed mechanically, an accurately proportional voltage will appear across it. It therefore follows that when an electrical wave is impressed across the crystal, the crystal dimensions follow the cyclic variations of the applied voltage and these dimensional changes reflect themselves as electrical effects. Thus, if a voltage of the right frequency is applied, the crystal will be set into mechanical resonance which, by the converse effect, will appear like an electrical resonant circuit to the applied voltage. Since the energy losses in such crystals are about 1/1000th of those obtaining in fairly good electrical circuits, the selectivity is improved enormously. Crystal circuits have now replaced electrical selective circuits in long distance telephony and a good many military radios also used them. There is no reason except possibly that of cost why they could not be incorporated into radio or television receivers today.

The same idea could be applied to the simplification of loud-speakers. When the piezoelectric effect is large enough the entire voice band can be transmitted, as is proved by the crystal type phonograph pickups. All that need be done is to attach the cone structure to a suitable crystal element. Quartz for various reasons is not suitable. Rochelle salt or one of the new artificial crystals developed by the Bell Telephone Laboratories would be satisfactory. Or perhaps the newly discovered property of that remarkable material, barium titanate, could be used. This refers to the discovery that if a powdery mass of this material is pressed together and given a high voltage jolt it becomes very strongly piezoelectric. This material might take the curse off the cost.

The application of crystals to television image formation is based on the discovery that supersonic waves in a liquid will diffract light. The manner in which this phenomenon is utilized is shown in Figure 1. There is a glass-sided cell filled with a transparent liquid. One end of the cell is closed off with a quartz crystal and the other by a suitable absorber. If the video signal is translated in frequency so that the midband is at twenty megacycles and is applied to the crystal electrodes, an acoustic wave train will move down the cell. This train will consist of alternate zones of compression and rarefaction progressing forward at the speed of sound in the liquid, say one thousand meters per second. The width of these alternating zones is about .006 inches on the average. Now the *change* in density in a given zone is proportional to the strength of the signal that caused it. This density variation causes proportionate changes in the speed of the light through that zone, a decrease in the dense zone et cetera. If a collimated—parallel—beam of light is passed through the liquid, the rays going through the less dense regions emerge before

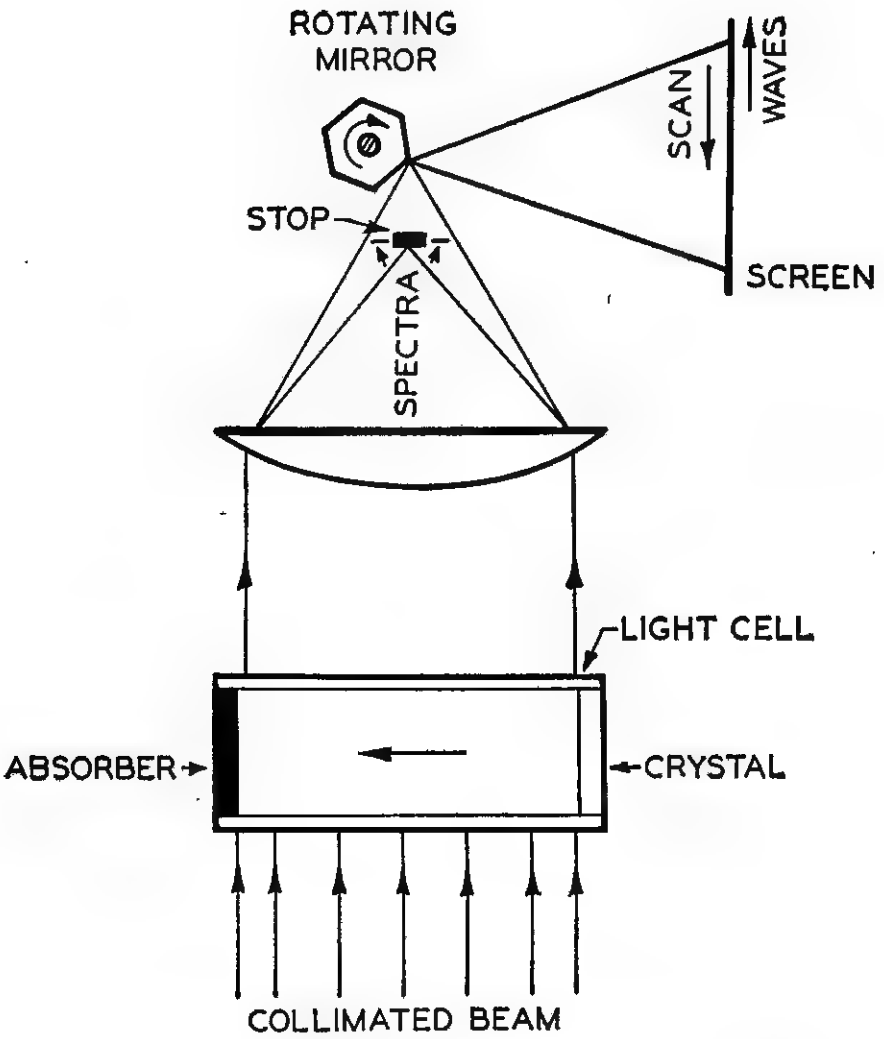


FIGURE 1.

Even television need not be confined to vacuum tubes. With crystals and liquids and a rotating mirror, equal or better results are possible.

those which had to pass through the dense zones. Therefore, each zone acts as a narrow slit-source whose emitted wave train differs in phase by some amount relative to its neighbors. The beams sent out will, therefore, periodically reinforce and cancel one another. If the light is intercepted by a screen, each pair of zones will produce a bright central image flanked by a less bright pair of images called the first order spectra. There are further images, the higher order spectra, but these are generally very dim. It turns out that the intensity of the spectra is proportional to the change in density and hence to the signal that caused this particular pair of zones. However the brightness of the central image is constant. The direct image is, therefore, stopped out leaving only the spectra which pass on to the screen.

Since the zones of light and shade move forward at high speed, the eye will not perceive them unless they are effectively arrested. This is done by letting the image fall first on a rotating polygonal mirror which imparts to each light element as it falls on it a speed equal and opposite to that of the wave. (At this point we apologize for introducing a gross motion. Perfection, alas, has not yet been reached.)

Suppose that at the transmitting end it takes one hundred microseconds to scan a picture line. If the cell is made ten centimeters long, it will take the signal precisely this length of time to traverse the cell. That is, the wave in contact with the vibrating surface represents the signal that had just come in. Ten centimeters out the wave represents the signal that came in one hundred microseconds ago. Thus the screen will show at each instant a record in light and shade of all the signals received in the past one hundred microseconds, or a complete picture line. When the next line is scanned the image on the screen must be shifted vertically by the line width. This is done by a lower speed rotating mirror at right angles to the first.

This system has the big advantage that the strength and nature of the light source can be chosen at will. With the kinescopes the intensity of the light is limited by the danger of burning out the phosphor. Because of this limitation, it is difficult to get enough light to yield large images. The system described is free from this trouble and fifteen foot pictures have been successfully obtained.

Up to this point we have described devices using atomic phenomena which, elegant though they are, are essentially adjuncts to the electron tube. The electron tube is a marvelous device but it has its troubles. From the standpoint of the large scale user the worst of these is its short working life, say two thousand hours. Now this is not bad if we are thinking of a home radio. If you run your set three hours a day, you should have

no trouble for two years. But suppose that you own an electronic computer like the ENIAC with eighteen thousand tubes. Then you can expect several failures per hour of operation. It is necessary to set up elaborate trouble locating circuits and in order to know that you are in trouble it is frequently necessary to run check problems. It takes a good chunk of the working day to locate the failures. The lost time and the extra features that must be engineered into a design form a heavy penalty for tube failure. Nor is this an isolated case. A transcontinental telephone call may involve several hundred tubes. The precautions against failure cost a lot of money, both for design and maintenance. Or again think what a tube failure would do in the proposed transatlantic submarine cable where the amplifiers are to be on the sea bottom!

Then there is the case of a radar design that was turned down because its complement of two thousand tubes was practically a guarantee of a failure occurring at an embarrassing time. All this points to the fact that installations with a large number of tubes tend to be self-defeating unless the most elaborate precautions are taken. Now if we only had an amplifying element that could not fail—

Well, we do have such a critter. The new physics has come up with a device that will not wear out! Barring misuse there is no physical reason why it should ever be replaced once it has been installed. Not only this. Just look at the other nice features that come with it. It has no filament or cathode. Consequently this power supply is eliminated together with the problem of disposing of the heat, which may well run into kilowatts in large installations. Since there is no filament there is no warm-up time, eliminating standby power drain. Then there is its small size, one eighth inch in diameter by three quarters inch length which will make for compact designs as well as for small storage space. It mounts like a resistor, by its leads, and hence no socket is needed. It has no vacuum to be maintained and it is simplicity itself to fabricate. This is not too surprising since it consists merely of a small piece of solid material with three leads attached.

This is the "Transistor," perhaps the greatest single step in electronics since the invention of the vacuum tube. It was invented at the Bell Telephone Laboratories and was the direct outcome of fundamental research in the field of Solid State Physics. Unlike most inventions of great importance, this one was not stumbled on but came directly from a theoretical analysis of the nature of electrical conduction in the so-called semiconductors. Though it is a very new device, less than a year old, it is already quite clear that it has vast possibilities. With it, radio and television sets, telephone amplifiers, oscillators and other devices

have been built and new applications are arising every day. Its field of applicability may be broader than that of the electron tube since its mode of functioning is so different. The moral to be drawn from all this is that pure research pays off and sooner than one might think.

In one form the device consists of a disk of silicon or germanium crystal about one eighth inch in diameter and about one thirty-second inch in height. The entire base comprises one electrode while there are two electrodes of very fine wire spaced about .002 inches apart. One of these is called the emitter and is biased with a small positive voltage. The other electrode is called the collector and is biased with a relatively large negative voltage. The signal is applied to the emitter while the load resistance is in the collector circuit. Roughly speaking, the emitter and the base combination perform the functions of the grid and the cathode while the collector acts like the plate. In its present state the device has a power gain of one hundred which means that the output signal carries one hundred times as much energy as the input signal. As to the frequency range, all that can be said at this time is that amplifiers have been built that operate well at ten megacycles.

How does it work? That is a rather difficult question to answer, not because the answer is not known, but because it is wrapped up in the language of Quantum Physics. Unfortunately, the concepts used in this field are not yet widely diffused. Consequently any explanation in terms of familiar concepts is bound to lack precision. The following may, however, serve to give the reader some idea of the workings of the device.

First of all, what features must a device have to be an amplifier? Essentially it is the co-existence of three basic features. First, there must be a reservoir of energy, say a battery, which can be drawn upon. Second, there is to be a variable element which can throttle the flow from the reservoir. Finally, there must be a control element which adjusts the size of the "throttle" proportionately to the signal impressed on the control. The combined action of the control and variable elements thus releases an amount of energy from the reservoir which, moment by moment, is an enlarged copy of the signal. According to this view the ear trumpet is not an amplifier since it does not draw on an external source of energy but merely concentrates the signal energy in the sound field. On the other hand the carbon telephone transmitter is a true amplifier. The diaphragm is the control element which varies the packing and hence the resistance of the carbon granules—the variable element. This resistance controls the amount of energy that is being withdrawn from the central office battery in accordance with the pressure exerted by the voice signal.

In the vacuum tube the energy reservoir is the plate battery. The electron stream from the cathode to the plate is the resistance element. That is to say, for a given plate-cathode voltage there is a certain current flow and the ratio, volts/-current, is the resistance. The grid is the control element since the number of electrons that may pass is controlled by the magnitude of the signal impressed on it. Thus if the number of electrons is decreased, the resistance is increased, et cetera.

There is an important principle to note here. In both cases discussed the amplification resulted from an externally caused variation of a resistive element. This is the most frequently used mechanism though it is by no means the only one.

Now it has been known for a long time that the resistance of semiconductors can be made to vary over a tremendous range by the size and more particularly by the sign of the voltage applied across them. This results in rectification, the property that was used in early radio sets for signal detection. So we see that crystals are capable of producing the resistance variation which is a prerequisite for amplifying action. What has been lacking is the means for controlling this resistance in accordance with an applied signal.

As a matter of fact, inventors have in the past proposed to imbed a control grid within the semiconductor and thereby produce amplifying action. These attempts came to nought for the reason that such a grid must be insulated from the other electrodes and yet must be thin enough to permit current to flow between them. This means that the thickness must be only a few atomic diameters, resulting in a wholly impossible fabrication problem.

In the case of the transistor this problem was avoided altogether. Generally speaking, this is what takes place: In semiconductors such as silicon and germanium there is a very thin layer of material just underneath the surface where the rectification takes place. This is the so-called barrier layer and has a very high resistance for negative voltages and a very low resistance for positive voltages with respect to the base electrode. The output electrode, the collector, is negative and thus normally very little current can flow through it from the power source. If the second electrode, the emitter, is placed near the collector and is energized by a positive voltage, there will be a tendency for relatively large currents to flow through this electrode even for small applied potentials. When this current leaves the emitter it spreads out in all directions but eventually most of it gets to the collector since the latter is at a lower potential than the base electrode. This current flow has a very important consequence. The charge carriers within the semiconductor which transport the emitter current modify the electronic structure of the barrier layer

and thus vary its resistance. Consequently the current flow from the battery in the collector-load circuit is altered in accordance with the input signal. This, then, is a rough description of the mechanism by which the transistor amplifies.

So much then for communication advances. It would be nice if we could list equivalent achievements in the field of power generation. These unfortunately do not exist. Perhaps the problems are tougher than the ones met in communications.

An interesting application of crystals has been suggested for the generation of small quantities of power, say a few watts. It involves the use of an organ pipelike device with a quartz crystal at the far end. If steam is blown in, a standing wave is set up. The crystal being placed at the node will be acted on by cyclic pressures and hence will deliver electrical power at the same frequency.

The direct conversion of heat into power still seems to be a long way off. There is a project under way at M. I. T. which is studying the conversion of solar energy into power. One of the lines of investigation concerns itself with the use of thermoelectric generators. Ordinary thermocouples will not do because their efficiency is only about one percent. However, certain semiconductors show more promise. The best found to date is lead sulfide—galena, the favorite crystal of the old crystal detectors, is lead sulfide—which had a measured efficiency of seven percent. In view of the tremendous effort now being expended on semiconductors it may just be possible that research will turn up a more efficient material. It will certainly be welcomed, and may have a far more important application than merely replacing the usual methods of converting heat to electricity.

At present, the Grade A #1 problem of atomic power application is that of getting heat energy out of the atomic piles as rapidly as it can be generated by uranium fission. Getting heat to flow out of a material is a slow, low-energy-rate business. But electric energy can be pumped through a conductor at a fantastic rate. If study of semiconductors can yield us an efficient heat-to-electricity device, energy released as heat inside the atomic pile can be converted within the pile to electricity, and that electric power can then be drained out at an enormous rate. That would permit the construction of small, high-power nuclear reactors, and begin to take advantage of the immense potentialities for concentrated power sources inherent in uranium fission engines. And it happens that two of the small number of elements that can be used in a nuclear reactor without upsetting the neutron balance are—lead and sulphur!

THE END.

BOOK REVIEW

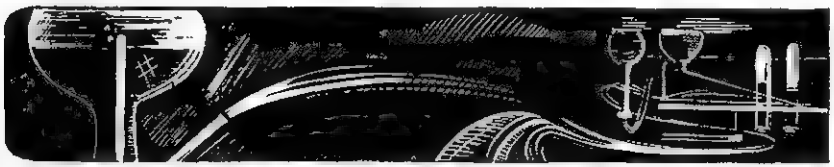
"Who Goes There?" by John W. Campbell, Jr. Shasta Publishers, Chicago. $3.00.

Very few science fiction writers have been outstanding successes both in the older gadget-ridden "thought variant" era and during the current renaissance as typified primarily by this magazine. Of those who have, certainly the most important is John Campbell, since as editor he has been in the position of developing the school of writing to which as Don A. Stuart he was making the notable contributions now collected in Shasta's first book of fiction. It is good news that a second collection, "Cloak of Aesir," is in preparation.

Campbell, under his own name, had proved the fertility of his imagination and his ability to build a story around a framework of science instead of using a pseudo-scientific backdrop for a routine "thud-and-blunder" action story. "The Mightiest Machine," recently issued by Hadley, was perhaps the peak of this phase of his writing. But as "Don A. Stuart" he began to write an entirely different and far more important kind of story, seven of the best of which—including the first, "Twilight," and its sequel "Night"—are now published in one volume. These were mood stories primarily, in which the writer's skill with words and with the scientific limitations of his plot and setting are intended to work powerfully on the reader's emotions.

In the long run, unless a story is "felt" by the reader it will not be remembered—and these are memorable stories. They prove that in different hands gadgets, concepts, or even characters—the three bases for stories which Campbell lists in his introduction—may provide either thin, momentary excitement or entertainment, or powerful and lasting stimulation to the imagination.

—P. Schuyler Miller.



BRASS TACKS

You've worked well into "Players" by now!

Dear Mr. Campbell:

The August issue looked fine when I first picked it up yesterday, and when I put it down this afternoon it was even better reading. What appeared to be another Alejandro superb work turned out to be a superb job by a new ASF artist. The stories were all good, with the sole sad exception of the serial.

As far as the An Lab goes:

"Smaller Than You Think": A new artist opens up with a snappy story. The ideas are good: The O-O and faster than light spaceship, and the refusal of the "backward" peoples to accept the new spaceship.

"Time Trap": I don't ordinarily like time stories, unless I get the superior type of "Time Wants a Skeleton" ('41), "By His Bootstraps" ('41), or "Far Centaurus" ('44). This is another one in the same class. Another new writer, another good story. Good.

"The Monster": Van Vogt's short one is a little too short to do the plot justice.

"Dreadful Sanctuary": After two good installments to develop the plot, the last goes to pieces fast. The cops and robbers ending sure let me down.

"Dawn of Nothing": Short and harmless.

On the whole the stories were all good reading, new ideas were used in abundance, the art, inside and cover, was excellent. Well worth the quarter.

Just received Fantasy Press' "Beyond This Horizon," by Heinlein-MacDonald. Haven't yet found major deviations from the original ASF 1942 presentation. When "World of Ā" came out in book form there sure were a lot of modi-

fications in it. The ASF version proved superior, in fact it took me four readings of the entire story to enable it to place fourth on my all-time rating scale. I have "Final Blackout" but have not reread the book version. Let us hope all the superior stories of ASF get reprinted in book form within the next ten years, because now the process of disintegration has begun to affect the 1934 issues of ASF I own.

Please send us the van Vogt "Players of Ā" mentioned in last issue In Times To Come. Could be a Null A sequel?—William E. Dorion, R.F.D. 1, Bedford, New York.

Philosophy In Science Fiction.

Dear Campbell:

Jack Williamson outdid himself and nearly everyone else in ". . . And Searching Mind." I think it is the best novel you ever printed.

In my opinion, we're coming into a new period of science fiction. The old, purely socio-technological story is starting to play out, just as the heavy-science yarn did a decade back. The reason for this decline is that it has simply been written too many times. Van Vogt's "The Rull" was at least as good as "Co-operate—or Else!" six years ago, with regard to style and ideas. Yet it affected me little. The ideas, which would have been startlingly new in 1942, were in view of all that has now been written mere piddling variations.

What is needed—and is beginning to appear—is another new approach. Back in the early forties, Heinlein's stories had an aura of newness about them, a green-as-grass reality, that none of us will forget. Simak put his "City" series across by utilizing nearly unthought-of and generally undesired developments in human civilization. Each of his stories yields vivid and fresh enjoyment, largely because neither space travel, nor the consequences of atomic energy, nor a utopian world-state is its central idea. Its reader takes part in brand-new ranges of human experience. This same factor of newness made van Vogt's "A Son Is Born" a brief masterpiece in my estimation.

Williamson's novel had this newness in it, as well as something more—a shift not only of ideas but also of basic orientation.

It has often been said that, whereas in the heavy-science tale the machine was the thing, the socio-technological story considers the gadget's effect upon the people and the culture involved.

Williamson went a step further. The plot of his story, beyond more mechanics, was based on the conflict between three *philosophies.*

Claypool began as a man totally immersed in science and fell into a trap set by the objective consequences of his own physics. Every terrible result of ideological totalism as a way of life is displayed in his

hopeless, destructive fight, first to defend his world against the Triplanetary Powers, and then to save mankind from the humanoids.

White, too, fell into the mortal sin of ideological totalism. So long as his prime purpose was to destroy the humanoids, he could accomplish little.

Ironsmith stands in vivid contrast to the former two. In him we find a man displaying *awareness*—as against totalism—on the three principal levels of human activity—biological, ideological, and psychic. Ironsmith is a high-order approximation to what L. L. Whyte calls "unitary man" in his book "The Next Development in Man." He practices about seventy percent of the philosophy set down eighteen centuries ago by a Roman ex-slave named Epictetus.

I must die. But must I die groaning?

I must be imprisoned. But must I whine as well?

I must suffer exile. Can anyone then hinder me from going with a smile, and a good courage, and at peace?

Sound familiar? I think it sounds like a miseducated Roman ex-slave trying to act like Frank Ironsmith.

Most of our writers had had technical training and just didn't think in terms of philosophy. So they ignored it. Heinlein dabbled with it. Simak mentioned it and then proceeded along his own unique way. Williamson made it a central idea in his finest story.

". . . And Searching Mind" is a story of conflict between three philosophies, existing in three men who lived in a world with a particular technology—this last being represented by rhodomagnetics and the humanoids. It thus contains all the factors of the socio-technological story *plus* a new factor—a deeper expression of the human element. Call it "philosophy."

This "deeper expression of the human element" has, of course, been used effectively before. Stuart made it the central idea in "Twilight." A fresh formulation may make the nature of this factor clearer.

The reality of a man's life lies in subjective experience. The "real" world in which a particular man lives is a neural abstract from an inferred event-level structure which one could call "the physical universe." Every man, then, literally lives in a different world—call it his "sigma-world." His sigma-world contains at any instant everything which he sees, hears, smells, tastes, feels, knows, infers, believes—including himself and his personality or philosophy.

The trick of subjective writing is to let the reader into the main character's sigma-world. Remember the beginning of Heinlein's "If This Goes On—?" Van Vogt's "World of Ā" was a masterpiece of this kind of writing, with only one deviation from strict sigma-world narration in its entire length.

Now this "deeper expression of the human element" can be de-

scribed as a deeper penetration into the character's sigma world. It may come as a sense of the inherent strangeness of human life, as a description of a new pattern of existence for man, or in any of a dozen other ways. Those sections of Williamson's story which tell of Claypool's emotions that night he saw the Crater Supernova are some of the finest writing in the English language. Simak's stories "Census," "Hobby," and "Aesop" are among the greatest science fiction produced this decade.

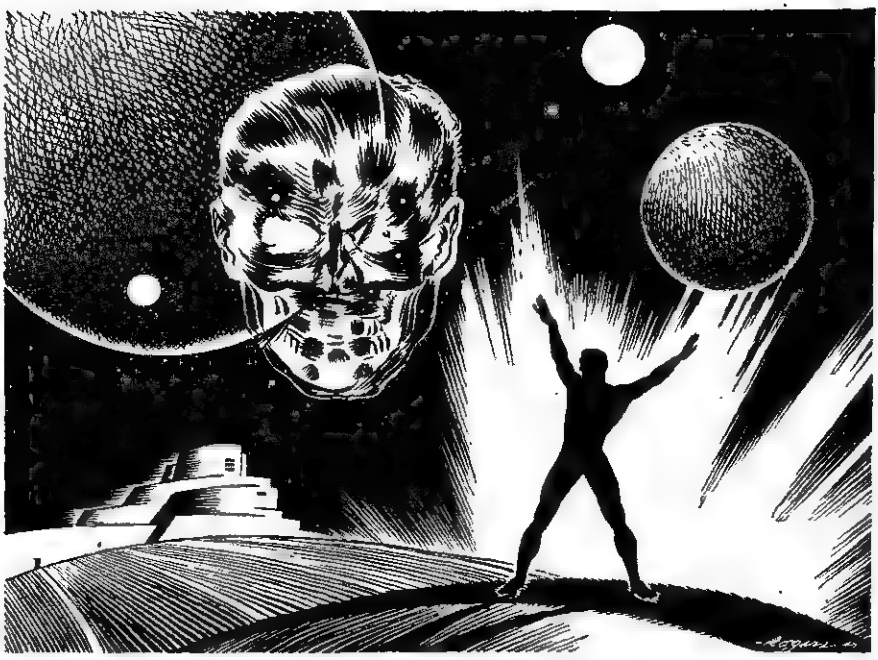
I hope to see more stories such as these I have mentioned in the pages of Science Fiction. In my opinion, they represent the vanguard of another renaissance such as that which came during 1939 and 1940. —William Bade, 1726 "P" Street, Lincoln, Nebraska.

"Dreadful Sanctuary" was very generally praised—you aren't alone in liking it. For that matter—I wouldn't have printed it if I hadn't got a kick out of it myself!

Dear Mr. Campbell:

Eric Frank Russell's "Dreadful Sanctuary" is the best serial you have run since "Fury." ". . . And Searching Mind" was almost as good, but this one beats it. It is really refreshing to read a story like this occasionally. Fine characterization, strong plot—I had wondered what the Norman Club's reason would be for wrecking the Moon Rockets . . . it's a bit weak, it seems to me, but doesn't harm the story any—good development, and I especially like the way Russell brings in the slightly-advanced setting; it could very easily be overdone. Most authors would do it like this: "Horab Kahn ground his hydroponic cigarette out in the *glastec* ashtray, and rose smoothly to his feet. He strode lithely to the degravity elevator over the thick carpet of rare Jovian *buracq* skin. The door opened as his body broke the photoelectric beam, and he entered the *stellon* cage—" And so forth. Russell brought the futuristic background in quite unobtrusively, I thought—an occasional reference to Vitalax, and a new song hit, such futuristic widgets as the visavox, and he had a smooth, well-knit background for the yarn.

I shan't comment on the rest of the magazine, except to burble in ecstasy over the Bonestell cover. You can junk Timmins and Alejandro, if you like, but if anything happens to Bonestell, you may expect a couple of negabombs pronto, via a space warp! The only inside illustrator you have that I could rave about is Cartier. Orban is good, but keep him away from spaceships and future machines. Can't wait to see *From Unknown Worlds!*—Lin Carter, 1734 Newark Street, South, St. Petersburg 7, Florida.



THE PLAYERS OF Ā

BY A. E. VAN VOGT

***Third** of Four parts. The Sleeping God becomes more than the center of a pagan religion to Gosseyn—a possible other self? a possible fulcrum for powerful action against Enro?*

Illustrated by Rogers

Synopsis

Non-aristotelian Venus was saved from conquest by the fortitude of its semantically trained inhabitants, and by the extra brain of Gilbert Gosseyn. After the defeat of the galactic forces that attacked the solar system, as chronicled in "The World of Ā"—August, September, October, 1945, Astounding Science Fiction; Simon and Schuster, 1948

—Gosseyn discovers that the Follower, a being who seems to be made of shadow substance, has developed a sinister interest in him.

In spite of his precautions, he is caught in a trap which the Follower sets for him, and is "instantaneously" transported by similarity means to the planet, Yalerta, where the Predictors live. The Predictors have been forced by the Follower to enter the service of Enro the Red, warlord and dictator-ruler of the Greatest Empire, who has launched a great battle in the Sixth Decant of the galaxy for the control of all space. It seems to Gosseyn that, with the help of people who can foretell every move of the enemy, Enro cannot possibly lose the war.

He discovers that whenever he uses his extra brain, his own future cannot be foretold by a Predictor.

He succeeds in escaping from the Follower with the help of Leej, a woman Predictor. But the Follower comes aboard Leej's skytrailer, and attacks him. The resulting battle ends in a draw, but Gosseyn realizes that the shadow-shape which the Follower can assume makes the Follower the most dangerous individual in the entire galaxy. He realizes also that, as matters stand, the Follower could defeat him under the proper circumstances, and that therefore he is not ready for a crucial battle between them.

This decides him to leave Yalerta by any means. But Yalerta is isolated from the rest of the galaxy, its only contact being the warship of the Greatest Empire, which is similarizing Predictors to the fleet in the Sixth Decant. His only hope is to seize the warship.

He does this by a skillful use of his extra brain and by bluff, taking Leej—the Predictor woman—abroad with him.

He has been a little worried that, somehow or other, the Follower might have foreseen his capture of the warship, and included it in his "trap." This fear is borne out when, as the ship is similarized by Captain Free towards the nearest base, Gosseyn's mind is transferred for a second time into the body of Prince Ashargin.

The first time such a transfer took place, Gosseyn had found himself in Ashargin's body just as the former heir to the Greatest Empire was being taken to the fortress palace of Enro the Red on the planet Gorgzid. The prince has been a prisoner attached to the work camp of the Temple of the Sleeping God, a prisoner so badly used that he has become unbalanced. Since this unbalance is on the unconscious level, Gosseyn realizes that the man will have to have semantic training. He has a plan to use the prince either to kill Enro, and so end the war, or to use him in some other way.

Before he can begin any training, Enro sends Ashargin to the flagship of Admiral Paleol, fighting the gi-

gantic and decisive battle of the Sixth Decant.

When Gosseyn's mind is similarized for a second time into the prince's body—apparently by a mysterious "player"—he discovers that the prince is still on the battleship. As a result of what he hears and sees, Gosseyn realizes that Enro's vast fleet, with the help of the Predictors, is sweeping all before it.

He decides that only the Venusian Ās can possibly turn the tide of battle, and they are cut off in the remote solar system by the fact that they have no means of galactic transport. Somehow, he must contact them, or get back to Venus personally.

He believes that his body on the destroyer Y-381907 has been captured by Captain Free, and so he sends instructions as Prince Ashargin that Gilbert Gosseyn and Leej be brought to Gorgzid, and that they must be treated with consideration.

As Prince Ashargin, he has already received orders from Enro that he return to Gorgzid. When he goes into the "Distorter" cage to make the journey, his hope is that he will find himself back in his own body.

Part 3

XIII.

Ābstracts

For the sake of sanity, be careful not to LABEL. Words like Fascist, Communist, Democrat, Republican, Catholic, Jew refer to human beings, who never quite fit any label.

Gosseyn expected to wake up in his own body. Expected it because it had happened on such an occasion the first time. Expected it with such a will to have it so that he felt a pang of disappointment as he looked through the transparent door of the "Distorter" cage.

For the third time in two weeks, he saw the military control room of Enro's palace.

His disappointment passed swiftly. Here he was, and there was nothing he could do about it. He stepped to the door, and was surprised to see that the room outside the cage was empty. Having failed to get back to his own body, he'd taken it for granted that he would immediately be asked to explain the meaning of the message he'd sent to Captain Free. Well, he was ready for that, also.

He was ready for many things, he decided as he headed for the great windows at the far end of the room. The windows were bright with sunlight. Morning? he wondered as he looked out. The sun seemed higher in the sky than when he had come to Enro's palace the first time. It was confusing. So many different planets in different parts of the galaxy moving around their suns at different velocities. And then there was the loss of time factor of the so-called instantaneous Distorter transport.

He estimated that it was approxi-

mately 9:30 a.m., Gorgzid City time. Too late to have breakfast with Enro and Secoh—not that he was interested. Gosseyn started for the door that led to the outer corridor. He half expected to be told to halt, either by a command from a wall phone or by the appearance of someone with instructions for him. No one stopped him.

He had no illusions about that. Enro, who had a special personal gift for seeing and hearing distant sights and sounds, was not unaware of him. This was a deliberately granted opportunity, a withholding of control rooted in either curiosity or contempt.

The reason made no difference. Whatever it was gave him a breathing spell free of tension. That was important, to begin with. But even that was unimportant in the long run.

He had a plan, and he intended to force Ashargin to take any and every risk. That included, if necessary, ignoring direct orders from Enro himself.

The corridor door was unlocked —as it had been a week before. A woman carrying a pail was coming along the corridor. Gosseyn closed the door behind him, and beckoned the woman. She trembled, apparently at the sight of the uniform, and she acted as if she was not accustomed to being addressed by officers.

"Yes, sir," she mumbled. "The Lady Nirene's apartment, sir? Two flights down. Her name is on the door of the apartment."

Nobody stopped him. The girl who answered the door was pretty, and looked intelligent. She frowned at him, then left him standing. He heard her farther inside the apartment hallway call, "Niy, he's here."

There was a muffled exclamation from inside. And then Nirene appeared in the hallway. "Well," she snapped, "are you coming in? Or are you going to stand there like a nitwit?"

Gosseyn held his silence. He followed her into a tastefully furnished living room, and sat down in the chair to which she motioned him. There was no sign of the other woman. He saw that Nirene was studying him with bleak eyes. She said in a bitter voice, "Speaking to you carries heavy penalties."

"Let me reassure you," said Gosseyn, "you are in no danger of any indignity from the Prince Ashargin." He spoke deliberately in the third person. "He's not a bad sort, actually."

"I have been ordered," she said, "ordered on pain of death." She was tense.

"You cannot help it if all your advances are refused," said Gosseyn.

"But then *you* risk death."

"The prince," said Gosseyn, "is being used for a private purpose of Enro. You don't think Enro will leave him alive after he's through with him."

She was suddenly very pale.

"You dare to talk like that," she breathed, "knowing that he might be listening."

"The prince," said Gosseyn, "has nothing to lose."

Her gray eyes were curious—and more. "You speak of him as if he is someone else."

"It's a way of thinking objectively." He broke off. "But I had two purposes in coming to see you. The first is a question, which I hope you will answer. I have a theory that no man can subjugate a galactic empire in eleven years, and that four million hostages held here in Gorgzid indicate tremendous unrest throughout the Greatest Empire. Am I right about that?"

"Why, of course." Nirene shrugged. "Enro is quite candid about it. He is playing a game against time, and the game interests him as much as the result itself."

"It would. But now, question two." Quickly, he explained Ashargin's position in the palace, and finished, "Has he yet been assigned an apartment?"

Nirene's eyes were wide and wondering. "Do you mean to tell me," she said, "that you don't really know what has happened?"

Gosseyn did not answer. He was busy relaxing Ashargin, who had suddenly become tense. The young woman stood up, and he saw that she was regarding him in a less unfriendly manner. She pursed her lips, and then looked back with a searching, puzzled gaze.

"Come with me," she said. She walked swiftly to a door that opened on to another corridor. She passed through a second door at the far end, and stepped aside for him to enter. Gosseyn saw that it was a bedroom.

"Our room," she said. Once again the tone was in her voice, and her eyes watched him questioningly. She shook her head finally. "You really don't know, do you? Very well, I'll tell you."

She paused, and tensed a little, as if putting the fact into words gave it a sharper reality; then: "You and I were married this morning under a special decree issued by Secoh. I was officially notified a few minutes ago."

Having spoken the words, she slipped past him, and was gone along the corridor.

Gosseyn closed the door after her and locked it. How much time he had he didn't know, but if the Ashargin body was ever to be reorientated, then moments like this must be utilized.

His plan was very simple. He would remain in the room until Enro ordered him to do some specific thing. Then he would disobey the order.

He could feel Ashargin quivering at the utter deadliness of such an idea. But Gosseyn held out against the weakness, and thought consciously for the benefit of the other's nervous system: "Prince, every time you take a positive action

or prevent a negative one, part of a conditioned reflex is established. The totality of such conditioned reflexes makes for automatic courage, automatic self-assurance and automatic skills."

All that was oversimplified, of course, but a necessary preliminary to higher level A training.

Gosseyn's first act was to go into the bathroom and turn on the hot water. He set the thermostat, and then, before undressing, went out to the bedroom to look for a mechanical device that would give off a rhythmic sound. He failed to find one.

That was disappointing, but still there were makeshifts that would do. He undressed and, when the tub was full, turned off the faucet, but allowed a steady leak, not too fast and not too slow.

He had to force himself to climb into the water. For Ashargin's thin body, it seemed hot to the point of scalding. At first he breathed gaspingly, but gradually he grew accustomed to the heat, and he settled back and listened to the rhythmic sound of the leak.

Drip, drip, drip, went the faucet. He kept his eyes unblinkingly open, and watched a bright spot on the wall at a point higher than eye level. *Drip, drip, drip.* Steady sound, like the beat of his heart. Beat, beat, beat—hot, hot, hot, he transposed the meaning. So hot, every muscle was relaxing. *Drip—drip—drip.* Re-lax, re-lax, re-lax.

There was a time in the history of man on Earth when a drop of water falling rhythmically on a man's forehead had been used to drive him mad. This, of course, was not on the head; the position under the faucet would have been uncomfortable. But the principle was the same.

Drip—drip—drip. The Chinese torturers who used that method didn't know that behind it was a great secret, and that the man who went mad did so because he thought he would, because he had been told he would, because he had absolute faith that the system would produce madness.

If his faith had been that it would produce sanity, the effect was just as great in that direction. If his faith had been that it would make a thin, gangling body strong, the rhythm worked equally well in that direction. *Drip, drip, drip.* Relax, relax, so easy to relax. In hospitals on Earth, when men were brought in taut from emotional or physical ills, the warm bath was the first step in relaxation. But unless other steps were taken, the tension soon returned. Conviction was the vital ingredient, a flexible, empirical sort of conviction which could be readily altered to fit the dynamic world of reality, yet which was essentially indestructible. Gosseyn had it. Ashargin did not. There were too many unbalanced developments in his weak body. Years of fear had kept his muscles flabby, drained his energy and stultified his growth.

The slow minutes dragged rhyth-

mically by. He felt himself dozing. It was so comfortable, so cozy, to lie in the warm water, in the womb of warm water from which all life had come. Back in the hot seas of the beginning of things, in the bosom of the Great Mother—and drift to the slow, pulsing rhythm of a heartbeat that still quivered with the thrill of new existence.

A knock on the outer door of the bedroom brought him lazily back to awareness of his surroundings. "Yes?" he called.

"Enro," came the strained voice of Nirene, "has just called. He wants you to report to him immediately."

Gosseyn felt the pang go through Ashargin's body. "All right," he said.

"Prince," said Nirene, and her tone was urgent, "he was very blunt about it."

Gosseyn nodded to himself. He felt stimulated, and he could not completely fight off Ashargin's uneasiness. But there was no doubt in his mind as he climbed out of the bathtub.

The moment for him to defy Enro had arrived.

He dressed, nevertheless, without haste, and then left the bedroom. Nirene was waiting in the living room. Gosseyn hesitated at sight of her. He was acutely conscious of Enro's special power of hearing and seeing through solid walls. There was a question he wanted to ask, but not directly.

The solution occurred to him after a moment. "Have you a palace directory?"

She walked silently to the videophone in one corner, and brought a glowing, flexible plate, which she handed him with the explanation: "Just pull this slide down. Each time it clicks it shows the floor of the person you want, and where his apartment is. There's a list of names on the back. It's automatically kept up to date."

Gosseyn didn't need the list. He knew what names he wanted. With a quick movement of his hand he slid the lever to Reesha, covering the action as much as possible.

Presumably, Enro could "see" through a hand as readily as through walls, but there must be some limitation to his gift. Gosseyn decided to depend on speed.

One glance he took, had his information—and then he shifted the lever to the name of Secoh. That, also, required only an instant. He moved the lever casually but swiftly to zero position, and handed the plate back to Nirene.

He felt wonderfully calm and at ease. The Ashargin body was quiescent, accepting the violent positivities that were being forced upon it with an equanimity that promised well for the future.

"Good luck," he said to Nirene.

He suppressed an Ashargin impulse to tell her where he was going. Not that Enro wouldn't know in a few minutes. But he had the feeling that if he named his destina-

tion an attempt would be made to divert him.

Out in the hall, he walked swiftly toward the stairway, climbed one flight of stairs, which brought him within one floor of Enro's apartments. He turned off to the right, and a moment later he was being admitted to the apartment of the woman he had once known as Patricia Hardie. He hoped that Enro would be curious as to what his sister and the Prince Ashargin had to say to each other, and that the curiosity would restrain him from immediate punitive action.

As Gosseyn-Ashargin followed the servant into a large reception room, he saw that Eldred Crang was standing at the window. The Venusian A detective turned as the visitor entered, and gazed thoughtfully at him.

There was silence as they looked at each other. It seemed to Gosseyn that he was more interested in seeing Crang than Crang could possibly be in the Prince Ashargin.

He could appreciate Crang's position. Here was an A who had come into the heart of the enemy stronghold, who was pretending—with her connivance—that he was married to the sister of the warlord of the Greatest Empire, and on that tenuous basis—more tenuous even than he might realize, in view of Enro's belief in brother-sister marriage—was apparently prepared to oppose the dictator's plans.

Just how he would do it was a

problem in strategy. But then there were people who might wonder how the Prince Ashargin could ever hope to set himself against the same tyrant. Gosseyn was trying to solve that problem by a bold defiance, based upon a plan that still seemed logical.

He had no doubt that Crang would be equally bold, if necessary. And that he would not have come at all if he had thought his presence would not have some effect.

It was Crang who spoke first. "You wish to see the Gorgzin Reesha." He used the feminine of the title of ruler on Enro's home planet.

"Very much."

Crang said: "As you possibly know, I am the Gorgzin's husband. I hope you don't mind telling me your business first."

Gosseyn welcomed it. The sight of Crang had braced him immensely. The non-Aristotelian detective was so skillful an operator that his mere presence on this scene seemed partial proof at least that the situation was not as bad as it seemed.

Crang spoke again. "What's on your mind, prince?" he said pleasantly.

Gosseyn launched into a frank account of what had happened to Ashargin. He finished, "I am determined to raise the level of the prince's position here in the palace. So far he has been treated in an unforgivably debasing fashion. I should like to use the good offices of the Gorgzin to alter the attitude of his excellency."

Crang nodded thoughtfully. "I see." He came away from the window, and motioned Gosseyn-Ashargin into a chair. "I hadn't really estimated your position in this picture at all," he said. "From what I had heard, you were accepting the debasing role which Enro assigned to you."

"As you can see," said Gosseyn, "and as Enro must be realizing, the prince insists that so long as he is alive he be treated according to his rank."

"Your use of the third person interests me," said Crang, "and I am also interested in the qualifying phrase 'so long as he is alive.' If you are able to hold firmly to the implications of that phrase, it seems to me the, uh, prince might obtain redress from the Gorgzid."

It was approval of a kind. It was cautious and yet unmistakable. It seemed to assume that the dictator might be listening in on the conversation, and so the words were on a high verbal level. Crang hesitated, then went on:

"It is doubtful, however, if my wife could be of much assistance to you as an intermediary. She has taken the position of being absolutely opposed to the war of conquest which her brother is waging."

That was information indeed, and from the look on Crang's face, Gosseyn realized that the man had imparted it to him deliberately.

"Naturally," said Crang, "as her husband, I also oppose the war without qualification."

Briefly, it was dazzling. Here was their method of boldness, different from his own, yet rooted in the special reality of Patricia's relationship to Enro. Gosseyn grew critical. The method had the same inherent flaws as did the opposition he was developing at this moment. How were they overcoming the flaw? Gosseyn asked the question.

"It seems to me," he said slowly, "that in taking such a stand, you and the Gorgzin have greatly restricted your freedom of action. Or am I wrong?"

"Partly wrong," said Crang. "Here in this sun system, my wife's legal rights are almost equal to those of Enro. His excellency is greatly attached to the traditions, the customs and the habits of the people, and so he has made no effort to destroy any of the local institutions."

It was more information. And it fitted. It fitted his own plan. Gosseyn was about to speak again, when he saw that Crang was looking past his shoulder. He turned, and saw that Patricia Hardie had entered the room. She smiled as her eyes met his.

"I was listening in the next room," she said. "I hope you don't mind."

Gosseyn indicated that he didn't, and there was a pause. He was fascinated. Patricia Hardie, the Gorgzin Reesha of the planet Gorgzid, sister of Enro—the young woman who had once pretended to be the daughter of President Hardie of Earth, and who had later pretended to be the wife of Gilbert Gosseyn—with so great a career of intrigue behind her, she was unquestionably a personality to be reckoned with. And, best of all, she had never to his knowledge wavered in her support of the League and of Ā.

She was, it seemed to him, becoming more beautiful, not less. She was not quite so tall as Leej, the Predictor woman, but she seemed more lithely built. Her blue eyes had the same imperious expression in them as was in Leej's gray eyes, and both women were equally good looking. But there the resemblance ended.

Patricia glowed with purpose. Perhaps it was a youthful purpose, but the other woman didn't have it. Possibly, he *knew* what Leej was like, and knew, also, Patricia's career. That could be very important. But Gosseyn thought it was more than that. Leej was a drifter. As long as she had been aware of her future, she had had no reason to be ambitious. And even if she should suddenly acquire a purpose, now that she could no longer depend on her prophetic gift, it would take a long time to change her habits and her basic attitude.

Crang broke the silence: "Prince," he said, and his tone was very friendly, "I think I can clear up your puzzlement as to why you are married to Lady Nirene. My wife, knowing nothing of the con-

versation of last week, took it for granted that any relationship between Nirene and yourself would be legalized by the church."

Patricia laughed softly. "It never occurred to me," she said, "that there were undercurrents in the situation."

Gosseyn nodded, but he was grim. He assumed that she was aware of Enro's past intentions for her, and that she regarded those intentions lightly. But she was missing additional undercurrents, it seemed to him. Enro must still hope for a legal marriage relationship with his sister, or he would not have tried to prevent her from learning that he regarded the relationship as unimportant where other people were concerned. His about-face gave a sharp insight into both his character and his purposes.

"Your brother," Gosseyn said aloud, "is a remarkable man." He paused. "I presume he can hear what we're saying here—if he so desires."

Patricia said: "My brother's gift had a curious history." She paused, and Gosseyn, who was looking directly at her, saw from her expression that she intended to give him information. She went on, "Our parents were either very religious or very clever. They decided that the male Gorgzid heir should spend his first year after birth in the crypt with the Sleeping God. The reaction of the people was hostile in the extreme, and so after three months Enro was removed, awakened, and thereafter his childhood was normal.

"He was about eleven when he began to be able to see and hear things in distant places. Naturally, father and mother immediately considered it a gift from the God himself."

"What does Enro think?" asked Gosseyn.

He didn't hear her answer. A rush of Ashargin memories flooded into his consciousness about the Sleeping God, bits of things he had learned when he was a slave of the temple.

Every report he had heard was different. Priests were allowed to look at the God at their initiation rites. Not one of them ever saw the same thing. The Sleeping God was an old man, a child, a youth of fifteen, a baby—the subsequent accounts had as little relationship as that.

Those details held Gosseyn's mind only flashingly. Whether those who looked were hypnotically deluded, or whether the illusion was mechanical seemed of incidental importance. The aspect of the picture that almost shocked Gosseyn out of his seat was the *detail* of the Sleeping God's daily existence—unconscious he was, but fed and exercised by a complicated system of machinery. The entire temple hierarchy was organized to keep that machinery running.

The light that broke upon Gos-

seyn at that moment was dazzling because—this was the way a Gosseyn body would be looked after.

His mind strained at the thought. For many seconds, the idea seemed too fantastic for acceptance. A Gosseyn body here at what was now the headquarters of the Greatest Empire. Here, and protected from harm by all the forces of a powerful pagan religion.

Crang broke the silence. "Time for lunch," he said. "That's for all of us, I believe. Enro doesn't like to be kept waiting."

Lunch! Gosseyn estimated that an hour had passed since Enro had ordered him to report. Long enough to set the stage for a crisis.

But lunch itself passed in virtual silence. The dishes were whisked off, and still Enro remained seated, thus holding the others to the table also. For the first time the dictator stared directly at Gosseyn-Ashargin. His gaze was bleak and unfriendly.

"Secoh," he said, without looking around.

"Yes?" The lord guardian was quick.

"Have the lie detector brought in." The steely gaze remained fixed upon Gosseyn's eyes. "The prince has been asking for an investigation and I am happy to oblige him."

Considering the circumstances, it was about as true a statement as Enro had made, but Gosseyn would have changed one word in the utterance. He had *expected* an investigation. And here it was.

Enro did not remain seated. As the lie detector knobs were fastened to Gosseyn-Ashargin's palms, he climbed to his feet and stood looking down at the table. He waved the others to remain in their chairs, and began:

"We have here a very curious situation," he said. "One week ago, I had the Prince Ashargin brought to the palace. I was shocked at his appearance and his actions." His lips twisted. "Apparently, he suffered from a strong sense of guilt, presumably as a result of his feeling that his family had failed the people of the Greatest Empire. He was nervous, tense, shy, almost tongue-tied and a pitiful spectacle. For more than ten years he had been isolated from interplanetary and local affairs."

Enro paused, his face serious, his eyes glowing. He continued in the same intense tone.

"Even that first morning he showed one or two flashes of insight and understanding that were not in character. During his week on the flagship of Admiral Paleol, he behaved to some extent as his past history would have led us to expect. During his final hour aboard the ship, he changed radically once more and again showed knowledge that was beyond the possibilities of his position. Among other things, he sent the following message to the destroyer, Y-381907."

He turned with a quick movement to one of the hovering secretaries, and held out his hand. "The

message," he said. A sheet of paper was handed to him.

Gosseyn listened as Enro read the message. Every word seemed as incriminating as he had known it was. A dictator, the most powerful warlord in the galaxy, had turned aside from his many duties to give attention to an individual whom he had intended to use as a pawn in his own game.

Whether or not the unseen player who had similarized the mind of Gilbert Gosseyn into the brain of Prince Ashargin had foreseen such a crisis as this didn't matter. Gosseyn might be a pawn himself, subject to being moved at someone else's will, but when he was in charge events happened his way—if he could make them.

Enro was speaking again in his dark voice. "It did not occur immediately to either Admiral Paleol or myself what mission that ship was on. I will say only this now. We identified the ship finally, and it seems incredible that Prince Ashargin should ever have heard about it. Its mission was secret and important. And though I will not mention the nature of the mission, I can inform the prince that his message was not delivered to the ship."

Gosseyn refused to accept that. "The roboperator on the flagship sent the message while I was there," he said quickly.

The big man shrugged. "Prince," he said, "it was not stopped by us. The message was not acknowledged by the destroyer. We have been unable to contact the Y-381907 for several days, and I am afraid that I shall have to ask you for some very straight answers. The destroyer is being replaced on Yalerta by a battleship, but it will require more than a month of flight for the replacement ship to reach that planet."

Gosseyn received the two pieces of news with mixed feelings. It was a great victory that no more Predictors would be sent from Yalerta for an entire month. The destroyer was another matter.

"But where could it have gone?" he asked.

He thought of the Follower, and grew tense. After a moment he rejected the more dangerous implications of that idea. It was true, apparently, that the Follower frequently was not able to predict events that were related to Gilbert Gosseyn. Yet that applied only when the extra brain was being used. It seemed reasonable, accordingly, to believe that he knew where Gosseyn was.

Right there that train of logic ended. There was no reason at all why the Follower should suddenly become secretive with Enro as to the whereabouts of the destroyer. Gosseyn gazed up at Enro with unflinching eyes. The time had come to deliver another shock.

"Doesn't the Follower know?" he asked.

Enro had parted his lips to speak again. Now, he brought his teeth together with a click. He stared at

Gosseyn with baffled eyes. At last he said:

"So you know about the Follower. That settles it. It's time the lie detector gives us some idea of what goes on in your mind."

He turned a switch.

There was silence at the table. Even Crang, who had been absently pecking at the food on his plate, stirred in his chair, and laid down his fork. Secoh was frowning thoughtfully. Patricia Hardie watched her brother with a faint curl to her lips. It was she who spoke first.

"Enro, don't be so stupidly melodramatic."

The big man twisted towards her, his eyes narrowed, his face dark with anger. "Silence," he said harshly, "I need no comments from a person who has disgraced her brother."

Patricia shrugged, but Secoh said sharply: "Your excellency, restrain yourself."

Enro turned toward the priest, and for a moment, so ugly was the expression on his face, it seemed to Gosseyn that he was going to strike the lord guardian.

"Always were interested in her, weren't you?" he said with a sneer.

"Your sister," said the priest, "is co-ruler of Gorgzid and of the overlordship of the Sleeping God."

Enro ran one hand through his red hair, and shook himself like a young lion. "Sometimes, Secoh," he said, and the sneer was broader, "you give the impression that you are the Sleeping God. It's a dangerous illusion."

The priest said quietly: "I speak with authority vested in me by the State and the Temple. I can do no less."

"*I* am the State," said Enro coldly.

Gosseyn said: "I seem to remember hearing that one before."

Neither man seemed aware of his remark. And for the first time it struck him that he was witnessing a major clash. Gosseyn sat up.

"You and I," said Secoh in a singsong voice, "hold the cup of life but for a moment. When we have drunk our fill, we shall go down into darkness—and there will still be a State."

"Ruled by my blood." Violently.

"Perhaps." His voice sounded faraway. "Excellency, the fever that has seized on you I shall feed until victory is achieved."

"And then?"

"You will receive the Temple call."

Enro parted his lips to say something. Then he closed them again. There was a blank expression on his face, that slowly changed into a comprehending smile.

"Clever, aren't you?" he said. "So I'll receive the Temple call, will I, to become an initiate. Is there anything significant, possibly, in the fact that you issue the calls?"

The priest said quietly: "When the Sleeping God disapproves of what I say or do, I'll know."

The sneer was back on Enro's face. "Oh, you will, will you? He'll let you know, I suppose, and then you'll tell us?"

Secoh said simply: "Your thrusts do not reach me, excellency. If I used my position for my own ends, the Sleeping God would not long tolerate such blasphemy."

Enro hesitated. His face was no longer dark, and it seemed to Gosseyn that the powerful ruler of one third of the galaxy felt himself on dangerous ground.

He was not surprised. Human beings had a persistent attachment for their own homes. Behind all Enro's achievements, inside the skin of this man whose word was law on nine hundred thousand warships, were all the impulses of the human nervous system.

In him they had become twisted until, in some cases, they were barely recognizable as human. Yet the man had once been a boy, and the boy a baby born on Gorgzid. So strong was the connection that he had brought the capitol of the Greatest Empire to his home planet. Such a man would not lightly insult the pagan religion by the tenets of which he had been reared.

Gosseyn saw that he had read correctly the processes of the other's mind. Enro bowed sardonically to Patricia.

"Sister," he said, "I humbly beg your pardon.

He turned abruptly toward Gosseyn-Ashargin. "These two people on the destroyer," he said. "Who are they?"

The moment for the test had come.

Gosseyn answered promptly, "The woman is a Predictor, of no particular importance. The man is called Gilbert Gosseyn."

He glanced at Patricia and Crang casually as he spoke the name so familiar to them. It was important that they show no sign of recognition.

They took it, it seemed to Gosseyn, very well indeed. They continued intently watching his face, but there was not a trace of surprise in their eyes.

Enro was concentrating on the lie detector. "Any comments?" he asked.

The pause that followed was of many seconds duration. Finally, cautiously, the detector said: "The information is correct as far as it goes."

"How much farther should it go?" Enro asked sharply.

"There is confusion," was the reply.

"Of what?"

"Identity." The detector seemed to realize the answer was inadequate. It repeated. "There is confusion." It started to say something else, but the sound must have been cut off, for not even the sense of a letter came through.

"Well, I'll be—," said Enro explosively. He hesitated. "Is the

confusion in connection with the two people on the destroyer?"

"No," said the detector briskly. "That is"—it sounded uncertain again—"that is, not exactly." It spoke up with determination, "Your excellency, this man is Ashargin, and yet he isn't. He—" It was silent for a moment, then lamely, "Next question, please."

Patricia Hardie giggled. It was an incongruous sound. Enro sent her a terrible glance. He said savagely:

"What fool brought this faulty detector in here? Bring a replacement at once."

The second lie detector, when it had been attached, said in answer to Enro's question, "Yes, this is Ashargin." It paused. "That is—he seems to be." It finished uncertainly, "There is some confusion."

There was some confusion now in the dictator, also. "This is unheard of," he said. He braced himself. "Well, we'll get to the bottom of it."

He stared at Ashargin. "These people on the destroyer—I gather from your message to Captain Free that they are prisoners."

Gosseyn nodded. "That's right."

"And you want them brought here. Why?"

"I thought you might like to question them," said Gosseyn.

Enro looked baffled again. "I can't see how you expect to use anyone against me once they're here in my power." He turned to the machine. "What about that, Detector? Has he been telling the truth?"

"If you mean, does he want them brought here? Yes, he does. As for using them against you—it's all mixed up."

"In what way?"

"Well, there's a thought about the man on the ship being here already, and there's a thought about the Sleeping God—they all seem to be mixed up somehow with Ashargin."

"Your excellency," interposed Secoh, as the astounded Enro stood silent, "may I ask a question of the Prince Ashargin?"

Enro nodded but said nothing.

"Prince," said the priest, "have *you* any idea as to the nature of this confusion?"

"Yes," said Gosseyn.

"What is your explanation?"

"I am periodically possessed, dominated, controlled and directed by the Sleeping God."

And, thought Gosseyn with deep satisfaction, let the lie detectors try to disprove that.

Enro laughed. It was the laughter of a man who has been keyed up and is suddenly confronted with something ridiculous. He sat down at the table, put his face in his palms, his elbows on the table, and laughed. When he looked up finally, there were tears in his eyes.

"So you are the Sleeping God," he said, "and now you have taken possession of Ashargin."

The humor of it struck him anew, and he guffawed for a full half minute before once more controlling

himself. This time he glanced at Secoh.

"Lord guardian," he said, "how many is this?" He seemed to realize that the question required explanation for the others at the table. He turned to Gosseyn. "During the course of a year, about a hundred people on this planet alone come forward claiming to be possessed by the Sleeping God. Throughout the Empire about two thousand red-haired men pretend to be Enro the Red, and during the last eleven years approximately ten thousand people have come forward claiming to be Prince Ashargin. About half of these are over fifty years old."

Gosseyn said: "What happens when they appear before a lie detector?"

The big man scowled. "All right," he said, "let's have it. How do you do it?"

Gosseyn had expected skepticism. Except for Crang, these were thalamic people. Even Patricia Hardie, friendly though she was to Venus, was not an Ā. Such individuals would hold contradictory ideas, and even discuss the contradiction, without in any way being influenced by the reality. The important thing was that a seed had been planted. He saw that Enro was scowling.

"Enough of this farce," said the big man. "Let's get down to some facts. I admit you fooled me, but I don't see how you expect to gain anything by it. What do you want?"

"An understanding," said Gosseyn. He spoke cautiously, yet he felt bold and determined. "As I see it, you want to use me for something. Very well, I'm willing to be used—up to a point. In return, I want freedom of action."

"Freedom of *what?*"

Gosseyn's next words took in the other people at the table. "In launching this war," he said, "you endangered the life of every person in the galaxy, including the Greatest Empire. I think you should accept advice from those who will share your fate if anything goes wrong."

Enro leaned forward, and drew his arm back as if to strike him in the face. He sat like that for a moment, tense, his lips compressed and his eyes bleak. Slowly, he relaxed, and leaned back in his chair. There was a faint smile on his face, as he said:

"Go on, hang yourself."

Gosseyn said: "It seems to me that you've concentrated so completely on the offensive part of the war that you have perhaps not taken into account some equally important aspects."

Enro was shaking his head wonderingly. "All this," he said in amazement, "from someone who has spent the last eleven years in a vegetable garden."

Gosseyn ignored the comment. He was intent, and it seemed to him

that he was making progress. His theory was simplicity itself. The Prince Ashargin had not been brought forward at this critical moment except for the most urgent reasons. He would not be lightly eliminated until the purpose for which he had been resurrected was accomplished.

Besides, this was a good time to obtain information as to just what Enro was doing about certain individuals.

"For instance," Gosseyn said, "there is the problem of the Follower." He paused to let that sink in, then went on. "The Follower is a virtually indestructible being. You don't think that, when this war is won, a man like the Follower will allow Enro the Red to dominate the galaxy."

Enro said grimly: "I'll take care of the Follower if he ever gets any ideas."

"That's easy to say. He could come into this room at this moment, and kill everybody in it."

The big man shook his head. He looked amused. "My friend," he said, "you've been listening to the Follower's propaganda. I don't know how he makes that shadow shape of his, but I decided long ago that all the rest was based on normal physics. That means Distorters and, in case of weapons, energy transmission. There are only two Distorters in this building not in my control, and I tolerate them. I defy any one to build machines in my vicinity that I don't know about."

Gosseyn said: "Still, he can predict your every move."

The smile faded from the other's face. "He can make any prediction he pleases," he said harshly. "I have the power. If he tries to interfere with it, he'll quickly find himself in the position of a man who has been sentenced to hang. He knows the exact day and hour, but there is nothing he can do about it."

Gosseyn said: "In my opinion you haven't thought that through the way you ought to."

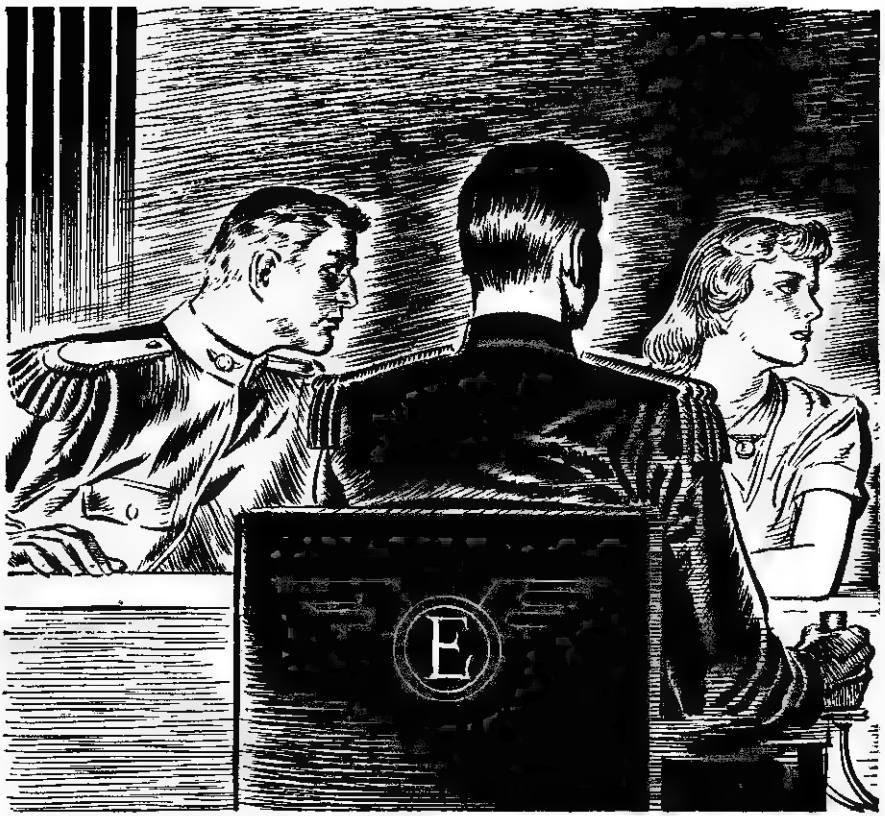
Enro was silent, his gaze fixed on the table. He looked up finally. "Anything else?" he said. "I'm waiting for these conditions you mentioned."

It was time to get down to business.

Gosseyn could feel the gathering strain on Ashargin's body. He would have liked to ease up a little on the tense nervous system of the prince. He thought of glancing at Crang, Patricia or Secoh to see how they were reacting to the developing situation. It would give Ashargin a moment of relaxation.

He suppressed the impulse. Enro had practically forgotten that there was anyone else present. And it would be unwise to distract his concentrated attention. He said aloud:

"I want to have permission to make a call anywhere in the galaxy at any time of the day or night.



Naturally, you can listen in—you or your agent, that is."

"Naturally," said Enro sarcastically. "What else?"

"I want to have the authority to use the Distorter transporter anywhere in the Greatest Empire at will."

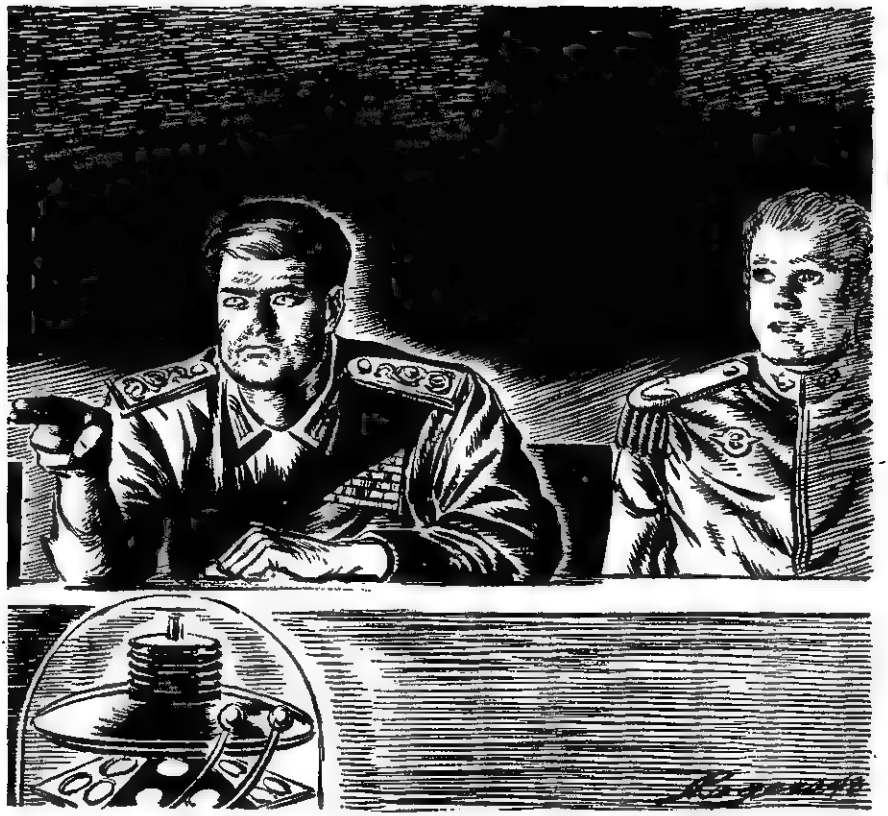
"I'm glad," said Enro, "you're restricting your movements to the Empire." He broke off. "Continue, please."

"I want authority to order any equipment I please from the Stores Department." He added quickly, "No weapons, of course."

Enro said: "I can see that this could go on and on. What do you offer in exchange for these fantastic demands?"

Gosseyn spoke his answer, not to Enro, but to the lie detector: "You've been listening to all this—have I been speaking frankly so far?"

The tubes flickered ever so faintly. There was a long hesitation. "You mean everything up to a point. Be-



yond that there is confusion involving—" It stopped.

"The Sleeping God?" asked Gosseyn.

"Yes—and then again, no."

Gosseyn turned to Enro. "How many revolutions are you fighting," he asked, "on planets of the Greatest Empire, where vital war equipment is being manufactured?"

The dictator stared at him sourly. He said finally: "More than twenty-one hundred.'"

"That's only three percent. What are you worried about?" It was a negative statement for his purposes, but Gosseyn wanted information.

"Some of them," said Enro frankly, "are important technologically out of proportion to their numbers."

That was what he had wanted to hear. Gosseyn said: "For what I have asked, I'll make radio speeches in support of your attack. Whatever the name of Ashargin is worth in controlling the empire, I place at your disposal. I'll co-operate until

further notice. That's what you want of me, isn't it?"

Enro stood up. "Are you sure," he said savagely, "that there isn't anything else you want?"

"One more thing," said Gosseyn.

"Yes?"

Gosseyn ignored the sneer in the big man's voice. "It has to do with my wife. She will no longer appear at the royal bathtub."

There was a long pause. And then a powerful fist smashed down on the table.

"It's a deal," said Enro, in a ringing voice, "and I want you to make your first speech this afternoon."

CHAPTER XIV.

Abstracts

For the sake of sanity, use QUOTATIONS: For instance, "conscious" and "unconscious" mind are useful descriptive terms. But it has yet to be proved that the terms themselves accurately reflect the "process" level of events. They are maps of a territory about which we can possibly never have exact information. Since Ā training is for the individuals, the important thing is to be conscious of the "multiordinal" —that is the many valued—meaning of the words one hears or speaks.

It was late afternoon when Gosseyn returned to Nirene's apartment. The young woman was sitting at a table writing a letter. She laid down her pen when he entered, climbed to her feet, and went over to a big chair. From its depths she gazed at him, her gray eyes steady.

"So we've all got about two months to live," she said at last.

Gosseyn-Ashargin pretended to be surprised. "That long?" he said.

He made no further comment. Just what she had heard about the luncheon incident or where she had heard it didn't matter. He felt sorry for her, but her destiny was not yet actually in his hands. When a ruler could order a woman to become the mistress or wife of a stranger because she had paused for half a minute to speak to him, that was a fact that defied normal expectations. She had made the mistake of being born a member of the old nobility, and she existed beside the abyss of Enro's suspicions.

It was Nirene who once more broke the silence. "What are you going to do now?"

Gosseyn had been asking himself the question, aware that it was greatly complicated by the possibility that at any moment he might be back in his own body.

But suppose he wasn't. Suppose he remained here for several days longer. What then? Was there anything he could do that would be of value now or later to either Ashargin or Gosseyn?

There was Venus. Were any Venusians out in space yet? Did they even know what was going on?

And he really ought to have a look at the Sleeping God. That involved obtaining permission from Secoh.

His mind paused as he came to

item number three on his list. Train Ashargin. He looked at Nirene.

"I've been driving the prince rather hard," he said, "and I think I'd better let him have a rest for about an hour."

"I'll call you when the time is up," said Nirene, and her voice was so gentle that Gosseyn glanced at her, startled.

In the bedroom Gosseyn rigged up a wall recorder to repeat a three-minute relaxation pattern. Then he lay down. During the hour that followed he never quite went to sleep. There was always the voice in the background, the monotone of Ashargin's voice repeating the few phrases over and over.

Lying there, he allowed his mind to idle around the harsher memories of Ashargin's prison years. Each time he came to an incident that had made a profound impression, he talked silently to the younger Ashargin. He made it as real as that, as if the fifteen, sixteen or twenty year old Ashargin heir was in each case a living entity inside him. The older Ashargin talked to the younger at a moment when the latter was undergoing a traumatic experience.

From his greater height of understanding, he assured the younger individual that the affective incident must be looked at from a different angle than that of a frightened youth. Assured him that fear of pain and fear of death were emotions that could be overcome, and that in short the shock incident which had once affected him so profoundly no longer had any meaning for him. More than that, in future he would have better understanding of such moments, and he would never again be affected in an adverse fashion.

It was one more A training makeshift, as had been all the others. But it was a system of self-therapy that was scientifically sound, and which would bring definite benefits.

"Relax," the voice soothed on. And because of what he was doing, every word meant, "Relax the tensions of a life time. Let all those past fears and doubts and uncertainties be discharged from the nervous system."

The effect did not depend on any belief that something would happen, though conviction made it more powerful. But it would take time. There were many suppressed memories that would have to be skillfully brought out in the open, before the therapy could be used on them.

Prince Ashargin was not going to be relaxed in one day.

Nevertheless, by the time Nirene knocked softly on the door, he had had not only the equivalent of an hour's sleep, but a psychoanalytic reorientation that under the circumstances he could have secured in no other way.

He stood up refreshed, feeling himself ready for the evening and the night.

The days stepped by, and the question was, how was he going to find out about Venus?

He had several possibilities. All of them required a hint as to what he wanted to know. Enro might be as quick at seeing the meaning in such a hint as the person to whom it was directed.

That was a risk he could not take until he had exhausted every other means.

At the end of four days, Gosseyn was a badly worried man. He saw himself isolated here in the body of the Ashargin heir, in spite of his so-called freedom of action, prevented from doing the only things that mattered.

Venusian Ās alone could stop Enro and the Predictors. That was his assumption, based on his observations and his knowledge of things as they were.

But as far as he knew, they were cut off. Unable to act. Easily destroyed by a dictator who had already ordered hundreds of planets pulverized.

Each day he hoped to be returned to his own body. He tried to help. He used Distorter "elevators" whenever possible to move from one building to another. Four times in four days he took trips to distant planets and back. But his mind remained in the body of Prince Ashargin.

He waited for a call informing him that the Y 381907 had been contacted. No call came.

What could be happening?

On the fourth day he went personally to the Interplanetary Communications Department. It occupied a ninety story high and ten block wide building. The building information section had one hundred roboperators redirecting calls to the proper sector centers. He identified himself to one of them.

"Oh, yes," it said. "Prince Ashargin. We have received instructions about you."

Gosseyn made his inquiry, turned away and then came back. He was curious about small things. "What kind of instructions?" he asked.

The answer had the frankness of Enro behind it. The roboperator said: "You can call anywhere, but transcriptions of every conversation must be sent to the Intelligence Center."

Gosseyn nodded. He could expect no more than that. He took a "Distorter" cage to the sector center he wanted, and seated himself at the videophone. Presently, he was saying: "I want to speak to Captain Free, or anyone aboard the Y 381907."

He could have made the call from Nirene's apartment, but here he could see the Distorter that carried the message. He could watch the contact attempt being made, as the roboperator dialed the pattern which, according to the foot-thick transparent plate that listed destroyers, belonged to the Y 381907.

All this he could see with his own eyes. If it was possible for him to prevent interference in the attempt to contact the destroyer, then this was one of the methods.

Another was to call from a planet

visited at random. He had done that twice, without result.

Now, a minute passed. Then two minutes. Still there was no answer. After about four minutes the roboperator said, "One moment, please." At the end of ten minutes, the operator's voice came again: "The following situation exists. When Similarity was raised to the known mechanical limit of twenty-three decimal places, a faint response was achieved. This was, however, an automatic process. It is evident that the pattern at the other end is still partly similarized, but that deterioration is continuous. Clearly, no attempt is being made by those on the ship to hold to the pattern."

"Thank you," said Gosseyn-Ashargin.

It was hard to imagine that his body was out there somewhere while his reasoning self was here attached to the nervous system of the Ashargin heir.

What could be happening?

On the sixth day, Enro went on the public videophone with a message. He was visibly jubilant, and his voice rang with triumph as he reported:

"I have just been informed by Grand Admiral Paleol, commander of our forces in the Sixth Decant area that the capital city of Tuul was destroyed a few hours ago by our invincible fleet. This is but one of an unending series of victories won by our men and our weapons against a fiercely resisting enemy.

"Fight on, admiral. The hearts of the people and the confidence of your government are with you."

Tuul? Gosseyn remembered the name with Ashargin's memory. Tuul was the stronghold of the most powerful State of the League group. It was one more planet out of thousands, but the fact that it was labeled "capitol" would be symbolic to the unintegrated minds to whom a map, in a semantic sense, was the territory, and the word the event itself.

Even for Gilbert Gosseyn, the destruction of Tuul was a turning point. He dared not wait any longer.

After dinner he invited Nirene to go with him to see Crang and Patricia. "I hope," he said pointedly, "that the Gorgzin and you can find a great deal to talk about."

She looked at him in momentary surprise, but he did not enlarge on his words. His idea for partially overcoming Enro's gift of clairvoyance could not be openly stated.

Nirene did her best. What she suspected was going to happen, Gosseyn had no idea. But at the beginning her voice hardly stopped.

Patricia's answers were halting at first. She looked distinctly taken aback by the machine-gunlike voice that fired at her so steadily. And then, suddenly, she must have caught on. She walked over and sat on the edge of Crang's chair, and began to talk back.

Nirene, ten feet away, hesitated, and then came over and sat on Ashargin's lap. The conversation that followed was the most active that Gosseyn had ever heard between two women. There was scarcely a moment during the rest of that evening when his own cautious words were not spoken against the background trill of wifely chatter.

Gosseyn first stated one of his lesser purposes. "Know anything about training extra brains?" he asked. It was the first time he had mentioned the word to Crang.

The slim man's fine, yellow-tinged eyes studied him thoughtfully. Then he smiled. "A little. What is it you want to know?"

"It's a problem of time, I think," said Gosseyn. "The first photograph is too slow, somehow. Slower than a chemical photographic plate, and the most complex of electronic tubes are chain lightning compared to it."

Crang nodded, and said: "It's notorious that specialized machines can perform any particular function much faster and frequently better than a given human appendage or organ. That is the price of our virtually unlimited adaptability."

Gosseyn said quickly: "You think the problem unsolvable?"

The other shook his head. "It's a matter of degree. It's possible the original training followed a wrong pattern, and that a different approach might bring better results."

Gosseyn knew what Crang meant. A pianist who learned the wrong system of fingering could not become a virtuoso until he laboriously taught himself the proper method. The human brain and body as a whole could be educated to achieve results in many different ways. Some of those ways were heartbreaking in the results they achieved, and some were so remarkable that the ordinary individual who had been properly conditioned came to be regarded as a genius.

The question was, how could his understanding of that general truth be utilized to re-train his extra brain when he returned to his own body?"

"I would say," said Crang, "that it's a matter of setting up conditioned reflexes."

They talked around that for a while. For the moment Gosseyn was not worried about what Enro might hear. Even if the dictator could "tune" out the almost unending vibration of sound from Nirene and Patricia, this part of the conversation would not mean anything to him.

He lost none of his caution, but he was preoccupied with a desire to find out what the nature of such a reflex would be. Crang made several suggestions, but it seemed to Gosseyn that the non-Aristotelian detective was still striving to estimate the extent of Ashargin's knowledge.

That decided him finally. He turned the conversation to the problem of possession of one mind by another. He pointed out that it might be done by an extra brain,

and that the similarization process involved could be a contact on a high level between a full grown extra brain and the vestigial of such a brain present in all human beings. Thus the greater would still come to the lesser.

Crang was watchful. "What puzzles me," he said, "is what would the extra brain be doing while it was in possession of the vestigial? Would it dominate both bodies at the same time, or would the greater be in a state of relaxation?"

"Relaxation, definitely," said Gosseyn.

It was a point he had been wanting to put over, and he was pleased. In spite of handicaps, he had managed to inform Crang that the Gosseyn body was unconscious.

Since Crang already knew that Gosseyn was aboard the Y 381907, his picture of the situation must be clearing up considerably.

"There was a time," Gosseyn went on, "when I took it for granted that such a position could only be maintained by some third party enforcing the interchange. It seems hard to believe"—he hesitated—"that the Sleeping God would leave his mind in a body so circumscribed as that of Ashargin if he had a way of preventing it."

He hoped Crang got the point, that Gilbert Gosseyn was not actually in control of his own destiny.

"And, of course," he went on, "Ashargin is only a puppet who has now done about as much as he can."

"I wouldn't say that," said Crang, deliberately.

So abruptly did they arrive at the main purpose of their intent and cautious interchange.

At least, Gosseyn reflected as he eyed the other, it was *his* main purpose. Crang's position in all this frankly puzzled him. The man seemed to be doing nothing. He had taken the risk—the terrific risk in view of what he had done on Venus—of coming to Enro's headquarters. And now here he sat day after day, doing nothing.

His plan, if he had any, would have to be important indeed to justify his inaction while the battle of the Sixth Decant moved relentlessly to a final decision.

Crang resumed briskly: "As I see it, prince, these mystical discussions can only lead so far. There comes a time when men act. Now, Enro is an outstanding example of a man of action. A military genius of the first order. His like will not be seen again in the galaxy for centuries."

It was strange praise, coming from the lips of Eldred Crang. And since it was false to facts—any Venusian A trained in military tactics could equal Enro's "genius"—it obviously had a purpose.

He shifted Nirene to a more comfortable position on his lap, and started to settle back.

At that moment he saw the opportunity for himself in what Crang had said. He interposed quickly: "It seems to me that men like

yourself will leave their mark on the military history of the galaxy. It should be interesting to follow the developments, and to know something about them."

Crang laughed. "Time will tell," he said—and changed the subject. He went on, "It's unfortunate that Enro is not yet recognized as the greatest military genius who ever lived."

Gosseyn nodded glumly. He recognized that something was coming. But his own question had been evaded. He was positive that Crang had understood what he had tried to say.

"And he won't answer," he thought grimly. "Well, if he's really got a plan, it had better be good."

"I feel sure," said Crang, "that after his death even the people of the League group will recognize and acclaim the consummate skill of the attack that is being launched against the central powers."

And now Gosseyn saw the plan. "Greatest . . . who had lived." "After his death—"

Crang was proposing that an attempt be made to kill Enro.

After a moment Gosseyn was amazed. There was a time when the idea of using Ashargin to kill Enro had seemed the only possible use to which so powerless an individual could be put. All that was changed. The Ashargin heir had already been used to influence billions of people. He was known to be alive. At the proper moment his influence might be decisive.

To sacrifice him now in an attempt to assassinate the dictator was comparable to throwing away a queen in a game of chess. Even at that first moment he had thought of it as a sacrifice. Now, with what he knew of Enro, he felt convinced that Ashargin would give up his life futilely.

Besides, the death of Enro would not stop the fleet. Paleol was there, gaunt and grim and determined. Paleol, and his thousands of officers who had put themselves beyond the laws of the League, would seize control of the Government against any group that tried to take over the Greatest Empire.

Of course, if Ashargin was killed trying to kill Enro, presumably Gilbert Gosseyn would be back in control of his own body. For him, who was still convinced that he would be able to return normally, that was something to consider a week hence. And—just in case—the plan *could* be started now. Preparations ought to be made.

Grudgingly, with many reservations, Gosseyn nodded his acceptance of the plot.

That ended the evening. He had expected that details would be discussed, but Crang stood up and said: "We've had a pleasant and amiable talk. I'm glad you were able to drop in."

At the door the A detective added: "You might try to imitate

the reflex that makes for good vision."

It was a possible method of training that had already occurred to Gosseyn. He nodded. "Good night," he said curtly.

His impression of the visit as he walked with a silent Nirene back to her apartment was one of intense disappointment.

He waited till Nirene was out of the apartment, and then called Madrisol of the League on the videophone.

He waited tensely while the call was put through. For this could be interpreted as treason. He had asked Enro for the right to phone anyone he pleased, but unauthorized individuals did not contact the enemy in time of war. He was wondering how close a watch the Intelligence Department kept on him, when the operator's voice came:

"The League secretary agrees to speak to the Prince Ashargin, but only under the condition that it is clearly understood that he is a legal authority speaking to an outlaw."

Gosseyn saw instantly the legal implications for Ashargin if he accepted such a ruling. He intended to do everything in his power to help the League win this war. If victory did result, then Ashargin would be in a dangerous position.

He felt annoyed, but after a moment he thought of a way out. "The Prince Ashargin," he said, "has imperative reasons for speaking to Madrisol, and therefore accepts the condition but without prejudice."

He had not long to wait after that. The lean ascetic looking face of Madrisol came onto the screen. The man's face seemed even thinner than when he had last seen them with the eyes of Gilbert Gosseyn's body. The League secretary snapped: "Is this a surrender offer?"

The question was so unrealistic that Gosseyn was pulled from his own purposes. Madrisol continued in a sharp tone: "You understand there can be no compromise with principle. All individuals in the ruling hierarchy of the Greatest Empire must submit themselves to trial by the League Tribunal."

A fanatic. In spite of his own complete opposition to Enro, Gosseyn's voice held a note of irony as he said: "Sir, don't you think you are making a hasty assumption? This is not, nor am I in a position to make, a surrender offer."

He went on quickly: "The reason for my call will probably surprise you. But first I want to caution you. It is of vital importance that you do not refer by name to the matter about which I am going to talk. What I intend to say will presently be reported to Enro, and any indiscretion on your part could have disastrous effects."

"Yes, yes, go on."

Gosseyn did not let it go at that. "Have I your word?" he asked. "Your word of honor?"

The answer was cold. "Honor does not enter into any relationship

between a League authority and an outlaw. But," continued Madrisol, "I shall certainly not make any revelations that would be dangerous to a friendly planet."

It was the promise he wanted. Yet, now that it had been made, Gosseyn hesitated. Ashargin's memory of entire sun systems being destroyed put a restraint on his tongue.

If Enro made a wild guess as to the planet involved, he could be counted on to act. A single suspicion would be sufficient. At the moment, Venus was an incident to the dictator. As long as it was kept in that status, the Venusians would probably be safe.

Madrisol's voice came impatiently: "I must ask you to come to the point."

Once more Gosseyn went over in his mind the words he had prepared. And took the plunge. He explained about the call that Gilbert Gosseyn had made several weeks before to Madrisol, and the request he had made at that time. He finished:

"Did you ever do anything about that?"

Madrisol was frowning. "I seem to recall the matter vaguely. I believe that one of my technician staff tried to put a call through."

"What happened?" Tensely.

"Just a second. I'll check to see if the call was actually made."

"Careful," cautioned Gosseyn.

Madrisol's lips pressed more tightly together, but he nodded. He came back in less than a minute. "No," he said, "the call has not yet been made."

Gosseyn stared at the man wordlessly for a moment. He was not absolutely convinced. It was expecting a lot of a man in Madrisol's position to reveal any information to the Prince Ashargin. But he remembered how curt the other had been when he had phoned him up from Venus. And this fitted. How it fitted.

He found his voice. "I urge you," he said, "to establish contact at once—personally."

He broke the connection, depressed. It was beginning to look as if Crang's desperate plan was not a last resort at all, but the only resort. And yet—no! Paleol would execute every person in the palace, Nirene, Patricia, Crang—

Gosseyn grew calm. No use thinking about such things. Unless some decisive action was taken, Nirene and Crang and Ashargin—at least—would shortly die anyway. He must remember the great role that Crang had played on Venus, and trust that the A detective was being as skillful now as he had been then.

He would attempt to kill Enro if Crang advised it.

It required more than an hour to figure out the pattern that he wanted. The actual words took only four and a quarter minutes to say into the recorder.

It was an intricate process that he began then, intricate in the sense

that he wanted to set up responses on the unconscious level of the mind, and actually change the reactions of the autonomic nervous system.

What he attempted then was old in human history. The superb legions of Julius Caesar defeated vaster armies of the barbarians because the nervous systems of Roman soldiers had been trained to co-ordinated fighting. The legions of Caesar would have stood little chance against the armies of the Eastern Roman empire of the Sixth Century.

There had been only a slight change in weapons, but the training of the men had been improved.

In 1940, the dictator Hitler had trained the nervous systems of his men in a new and different type of mechanical warfare. He was not defeated until superior numbers of men and machines adopted his methods. The machines existed before the *blitzkrieg,* but the nervous systems of the men who operated them had to be trained to the new integration. When that training was complete, superiority existed automatically.

In the days that followed the fumbled peace of World War II, more and more people began to accept the conclusions which the new science of General Semantics was laboriously deriving from the mass of available evidence. One of these conclusions was, "The human nervous system is uniquely capable of unlimited training, but the method is the determining factor."

NIRENE

PATRICIA

Gosseyn's—and Crang's—idea was based on a principle of vision. A relaxed eye sees best. The normal eye remains relaxed when it shifts steadily. When, for any reason, an eye capable of good vision begins to stare, the image blurs. Unlike a camera, the eye sees clearly only on the instant following the relaxing shift.

It seemed to Gosseyn that if he could, while in Ashargin's body—while he was waiting—discover an automatic way for his extra brain to relax, then he would attain a quicker and sharper "photograph" for similarity purposes. How could an extra brain be relaxed? An obvious approach would be the associative relaxation of the surrounding tissue.

So he set about relaxing the *blood vessels* of the cortex, the thalamus, and the sub-cortex—where the embryo extra brain of Ashargin would be located.

By association, all the cells around the blood vessels would automatically relax, also. That was the theory, and it had been proven many times.

Each time the voice on the recorder made the suggestion, he imitated the method he used with his extra brain in his own body to obtain a "memorized" area. Two hours went by. He reached the point where he could follow the pattern and think of other things.

"Relax—look . . . relax—look . . ." The assassination plan would have to be very carefully worked out if it was true that Enro had guards watching him from peepholes in the walls. "Relax –look . . . relax—look . . . relax—look . . ." There were several possibilities, of course. Since Ashargin was supposed to make the attack, the whole of the prince's position had to be considered. Suppose that both Ashargin and Gosseyn were dead a week hence, would that revive automatically the nearest Gosseyn replacement body, in this case the Sleeping God of Gorgzid?

"Relax—look . . . relax –look . . ." If it was the latter, then Gosseyn could see merits in the plan. He tried to imagine the effect if the Sleeping God should rise up to confront Enro and Secoh. "Relax—look . . . relax—look . . . relax—look . . ." It seemed to Gosseyn that there was one preliminary which he must take care of personally.

If the sequence of events actually followed the pattern he had pictured, then he must make an investigation. He was assuming that the Sleeping God was a Gosseyn body.

That would have to be checked.

Enro did not turn up for lunch. Secoh, who arrived late, explained: "He has gone to see Admiral Paleol."

Gosseyn studied the priest as he settled himself at the table.

At forty, the other's face was marked with an intricacy of the passions that had impelled him to strive for the great rank he held. But

there was more than that. After the way Secoh had talked to Enro on the day the lie detector was used on Ashargin, it seemed probable that the lord guardian was a man who believed what he taught.

Was this the moment to broach the subject of an interview? Gosseyn decided that it was. How should he bring the matter up? His method, when he finally spoke, was frankness. When he had finished, Secoh stared at him thoughtfully.

Twice, he parted his lips to speak. Twice, he stirred in his chair as if he intended to get up and leave. At last, he said mildly: "The privilege of seeing the Sleeping God is granted only to members of the Order."

"Exactly," said Gosseyn.

Secoh looked startled, and Gosseyn hoped that there was a picture in his mind of what it would mean to have it publicly known that the Ashargin heir was a convert to the pagan religion that he cherished. Did he have a vision of an entire galaxy worshiping before the videophone image of the crypt of the Sleeping God? Gosseyn hoped so.

Secoh put down his fork and knife, and placed his hands on the table. They were slim and delicate looking hands, but there was firmness in them, also. He said at last in a kindly voice:

"My boy, I don't wish to discourage you. Your position is an anomalous one. I would be happy to personally give you the lower order instruction, and by an extension of my discretionary powers I think that could be made to include the Ceremony of the Beholding."

So that was what it was called.

"I must warn you, however," Secoh went on, "the usual protection assured novices and initiates would not be accorded to you. We are in process of creating a universal state and our great leader has found it necessary to make hard decisions regarding individuals."

He stood up. "Tomorrow morning," he said, "be ready at six to go to the Temple. In view of your claims last week to be possessed, it has been my intention to take you into the presence of the Sleeping God. I am curious to know whether or not there will be an omen."

He turned and walked away from the table, and out of the room.

In Gosseyn's case, the lower order instruction was part of the Ceremony of the Beholding. It was a history of the Sleeping God, and fascinating in its own way after the manner of folk tales.

The Temple of the Mound had existed before men were on Gorgzid. In the misty past, after he had created the universe, the god had chosen the planet Gorgzid for his resting place. There, guarded by his chosen people, he slept from his arduous labors. A day would come when, waking at last from his brief slumber—brief in the cosmic sense—he would rise and carry on his work.

To his people of Gorgzid had been

given the task of making the world ready for his awakening. On that bright day he would want a universe united.

As the rites proceeded, and the picture unfolded, Gosseyn realized many things for the first time. This was the justification for Enro's conquests. If you accepted the initial assumptions, then all the rest followed.

Gosseyn was shocked. He was making an assumption of his own, that this was a Gosseyn body. If such was the madness that built up around Gosseyn bodies, then he who was immortal by means of a series of such bodies, would have to reconsider the whole problem of his immortality.

It was about nine o'clock when he was dressed in a long white robe, and the Parade of the Beholding began. It was a curious route they took, down steps that fitted into a curved metal wall. They came to a depth in which was an atomic pile drive—and Gosseyn had his second shock.

A spaceship! The Temple of the Mound was a ball-like spaceship buried in the soil drift of centuries, perhaps of thousands of years.

They were climbing now, up the opposite curved wall. They came to the central floor, and turned into a room that hummed with the faint undercurrents of sounds. Gosseyn suspected the presence of many machines, but he didn't have his extra brain to verify the suspicion. The far wall curved into the room. From each corner arched a columned pylon. The four curved pilasters ended on a narrow buttress about twenty feet out from where the wall should have been.

It could have been the head of a coffin. The inner wall was translucent and glowed with an all-pervading light. Little steps led from it to the top of the buttress. Secoh climbed one of the staircases, and motioned to Gosseyn to climb the one that led up from the other side. As he reached the top, a panel slid open in the upper portion of the crypt.

"Kneel," said Secoh sonorously, "and behold!"

From the kneeling position Gosseyn could see the shoulders, part of the arms and chest, and the head of the man who lay inside. The face was lean and very lax, the lips slightly parted. It was the face of a man of about forty. The head was large and the face had a strangely blank look. It was a good-looking countenance but only because of its symmetry and line of cheek and bone. It was the face of a moron. There was not even a faint resemblance to Gilbert Gosseyn.

The Sleeping God of Gorgzid was a stranger.

They arrived back at the palace in time for lunch, and at first Gosseyn did not realize that the great crisis was upon him.

There were two guests in the salon in addition to Enro, Patricia, Crang and Nirene—altogether eight

people at the table. The visitors wore uniforms complete with the insignia of the rank of marshal. The conversation at the table was dominated by Enro and the two military men.

Their conversation had to do with a Board of Inquiry that had investigated what was called a revolution. Gosseyn gathered that the revolution had been successful for reasons that were still obscure. The two officers were the Board.

He watched them curiously. They both seemed, in their manners and expressions, ruthless men. Before they announced their recommendations he decided that two such coldly intellectual individuals would inevitably solve any such problem by recommending the destruction of the rebel planets.

He glanced at Crang and saw that the A detective was impassive, but that, beside him, Patricia was showing signs of agitation. He realized that there must have been mention of the Board's work before his arrival in the salon. The two of them were definitely interested in what was going on. Abruptly, Patricia broke into the conversation.

"Gentlemen," she said sharply, "I sincerely hope that you have not chosen the easy way out in coming to your decision."

The two officers turned and glanced at her, and then, as of one accord, looked questioningly at Enro. The Gorgzid studied his sister's face, a faint smile on his lips.

"You may be sure," he said suavely, "that Marshals Rour and Ugell will have considered only the evidence."

"Naturally," nodded Rour. Ugell merely gazed at Patricia with his ice-blue eyes.

"I want to hear the recommendations," said Patricia curtly, "before I make up my mind as to that."

The faint smile remained unchanged on Enro's face. He was enjoying himself. "I seem to remember a rumor," he said, "that my sister once took a special interest in the system under discussion."

To Gosseyn the realization of the truth had come many seconds before. Venus! This was the Board of Inquiry that had been appointed to investigate the defeat of Thorson in the solar system.

"Well, gentlemen," said Enro amiably, "I see that we are all interested in hearing what you have to say."

Ugell took a paper from an inner pocket, and put on a pair of glasses. He looked up. "Are you interested in the reasons for our decision."

"Most certainly," said Enro. "What I want to know is, what happened? How did Thorson, one of the great trouble shooters of the empire, fail on a mission that was to be a mere incident in his career?"

Rour was silent. Ugell said: "Your excellency, we questioned more than a thousand officers and men. Their stories made the following picture. Our armies successfully captured the cities of the

rebels. Then, on the death of Marshal Thorson, the new commander ordered that Venus be abandoned. Naturally, these orders were carried out. So you see it is no disgrace to our arms, but the action of one man for reasons which we have not been able to discover."

The picture was reasonably accurate. It failed to mention that the Venusian Ās had successfully defended their planet against the attacking forces. The investigation had not ferreted out the role that Gilbert Gosseyn had played in the death of Thorson, but, still, the facts that had been discovered were a part of the reality.

Enro was frowning. "Was Thorson murdered by his successor?" he asked.

"There is no evidence pointing in that direction," said Rour, as Ugell failed to answer. "Marshal Thorson was killed during an attack which he personally led against a rebel stronghold on the planet, Earth."

Enro exploded into anger. "The incredible fool," he said savagely. "What was he doing leading any force in person?" With an effort the dictator controlled himself. "However, gentlemen, I am *very* glad to have heard this account. It fits in with some information which I already have, and with some theories of mine. At the moment I am troubled in my own palace here by people who are foolishly plotting against my life, and so I should like you to give me the name of the officer who succeeded Thorson as commander of our forces on Venus."

Ugell read from the paper: "His name is Eldred Crang. We have been unable to find any trace of this traitor."

Enro stared straight ahead. "And, gentlemen, what are your recommendations with regard to these planets?"

"It is recommended," read Ugell in a monotone, "that the habitable parts of the system be sprayed with any one-year radioactive isotope that is available in the region, and that the system be rendered uninhabitable."

He looked up. "Marshal Rour is rather taken with a new idea that a young woman psychologist has been urging upon him recently. That is, that some planet be populated solely with criminally insane people. It seemed to us, though this notion was not incorporated in the text of our findings that it might be an interesting experiment to carry out as soon as the planets in question become habitable again."

He handed the document to Enro, who took it without a word. There was a pause while he read it.

So Enro had known all the time. That was the thought that Gosseyn held in his mind. Their silly little plot—which had never really got beyond the embryo stage—had probably amused him even as he pondered the most devastating answer he could make to all their hopes.

It seemed clear also he had known for some days who Eldred Crang was.

Enro was passing the document to Patricia. Without looking at it, she started to tear it up.

"That, gentlemen, is what I think of your recommendations."

She climbed to her feet. Her face was colorless. "It's just about time, Enro," she said, "that you and your executioners stop this mad murder of every one who has the courage to oppose you. The people of the planets Venus and Earth are harmless."

"Harmless?" said Rour involuntarily. "If they're so harmless, how is it that they were able to defeat our armies?"

She turned on him, her blue eyes flashing. "Your report has stated—just now—that there was no defeat. That the action to retreat was taken at the command of the officer who succeeded Thorson."

She leaned towards him. "Is it possible that you are trying to cover up a defeat for our forces by a false statement, an appeal to the vanity of my brother?"

She was beside herself, in a thalamic fury. With a gesture she waved aside his effort to speak, and answered her own question.

"Never mind," she said, "your facts are reasonably accurate. I'll vouch for them. Because I gave the order to the officer who succeeded Thorson. He had no recourse but

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to obey the sister of his ruler. He sits here beside me as my husband."

"His price was high," sneered Enro.

He turned to the military men. "Gentlemen, I have known for several days the identity of Eldred Crang. I am unable to act against him as a traitor because here on Gorgzid my sister's authority is very similar to my own, and I am bound by my religious faith to uphold her rights. I am trying to persuade the lord guardian to . . . uh . . . grant her a divorce, and he has taken the request under advisement."

The words were earnestly spoken. It was hard to believe that behind the apparent logic and integrity of them was Enro's determination to use that religion to compel his sister to follow the ancient Gorgzid custom of brother-sister marriage. And that all the rest was fabrication.

Patricia was speaking again, earnestly: "The people of the solar system have developed an educational system of the highest order, a culture which I should like to see modeled throughout the galaxy."

She turned to look down at her brother. "Enro," she said, "there can be no point in destroying a system which has devoted itself to education. If at any time it should be necessary to take over those planets, it could probably be done without bloodshed."

Enro laughed. "An educational system, eh?" He shrugged cynically. "Secoh will be only too happy to tell you the plans the Temples have for subjugated planets."

He turned to the marshals and there was a savage note in his voice as he said: "Gentlemen, I must apologize for my sister's ill-tempered rudeness. She has a tendency to forget that her rule as Gorgzin does not extend beyond the planetary system where she and I are joint heirs. In ordering Lieutenant general Crang to withdraw our forces from Venus, she forgot that the Greatest Empire is a private achievement of my own. In marrying him, and permitting him and"—he hesitated, and glared for an instant at Gosseyn-Ashargin—"other upstarts to plan against me under her protection, she forfeited any right which she might have had to appeal to the softer side of my nature."

His teeth snapped decisively. He said grimly: "You may be sure that I do not appoint Boards of Inquiry, and then ignore their recommendations. And, as a precaution, to insure that the Gorgzin does not place herself in jeopardy by going to Venus, I shall immediately issue an order that no galactic 'Distorters' can be used by her until after the destruction of the population of the solar system has been carried out as recommended. Thank you, gentlemen. You have my best wishes."

Gosseyn noticed that the negating order did not extend to Prince Ashargin. He said nothing, but immediately the meal was over, he headed

for the public "Distorter" system of the palace. He didn't know if it was possible to go to Venus in a "Distorter" cage—by ship, yes; but he couldn't get hold of a ship—and so his only recourse was to make the attempt.

He took the torn segments of the Venusian report from his pocket—he still had to admire the way Crang had removed them from Patricia's plate, studied them briefly, and then casually passed them on to Ashargin—and quickly pieced them together.

The galactic co-ordinates of the position in space of Sol were printed right across the top of page one. He read, "Decant Eight, r36,400 theta 272° Z1800—"

Thirty-six thousand four hundred light-years from the galactic axis, at an angle 272° from the standard line—which was based on some remote galaxy—and eighteen hundred light-years on the minus side of the galactic plane. And his very first task must be to get to Decant Eight.

As he pulled the lever in the "cage," Gosseyn felt the change. Felt himself return to his own body—free of Ashargin.

He wakened in the swift fashion of the change, sat up abruptly. And then lay back with a groan as every stiff muscle in his body shrieked in protest against the sharp movement.

There was a feminine exclamation from near the bed. Leej came into the line of vision of his smarting eyes.

"You're awake," she said, and her voice was little more than a whisper. "I thought something was going to happen, but I couldn't be sure."

Tears came into her eyes. "I've got to tell you," she said. "We're cut off. Something has happened to the 'Distorter' system. The ship is marooned. Captain Free says it will take us five hundred years to get to the nearest base."

The mystery of the lost destroyer, Y 381907, was explained.

XV.

Abstracts

A few of the operational principles of general semantics are as follows: (1) Human nervous systems are structurally similar one to the other, but are never exactly the same. (2) Any human nervous system is affected by events—verbal or nonverbal. (3) An event—that is a happening—affects the body and mind as a whole.

Gosseyn did not try to move again immediately. His eyes were watering from the sudden flood of light, but his vision was better. His body ached. Every joint and muscle seemed to be protesting the one attempt he had made to sit up.

He recognized what had happened. Allowing for the passage of time during "Distorter" transport, he had been away from the destroyer for about a month. During the whole time his body had been lying unconscious.

Compared to the attention the

Gosseyn bodies must receive from their automatic "incubators," the care he had been given during the month just past, however well meaning, had probably been on a level only slightly higher than primitive.

He grew aware again of Leej. She was sitting on the edge of the bed, watching him with eyes that glowed emotionally. But she said nothing, and so, favoring his stiff muscles, he looked around the room.

It was a rather nicely furnished bedroom with twin beds. The other bed had been slept in, and he surmised that it had been occupied by Leej. He passed instantly on to the thought that they were probably imprisoned together.

That was an assumption that he intended to check on as soon as possible.

His gaze came back to her, and this time she spoke. "How are you feeling? The pictures I have are not clear on that point."

He managed a reassuring smile for her. He was just beginning to realize what a disastrous month it must have been for a woman of her position. In spite of what the Followers had tried to do to her, she was not really accustomed to danger or reverses.

"I think I'm all right," he said slowly. And his jaw ached from the effort at speaking.

Her delicate face showed concern. "Just a moment," she said, "I'll get some ointment."

She disappeared into the bathroom, and emerged almost immediately with a small plastic tube. Before he could realize her intention, she drew the bedclothes from him. For the first time he realized that he was completely undressed. She squeezed a fine slick of oil onto her palm, and began to rub it vigorously into his skin.

"I've been doing this all month," she smiled. "Just imagine."

Oddly enough, he knew what she meant. Imagine Leej, a free Predictor, who had servants for every purpose, actually performing such menial labor herself. Her amazement at herself made the intimacy of the act subtly right and normal. He was no Enro, requiring the soft feel of women's hands to make him happy, but he settled back and waited while she rubbed the ache out of his legs, arms and back. She stepped away finally and watched his hesitant attempts to sit up.

To Gosseyn, his helplessness was a startling condition. Not really unexpected, but a reality which somehow he would have to take into account in the future. While he experimented with exercising his muscles, Leej brought his clothes out of a drawer.

"I had everything cleaned," she said, "in the ship's cleaning plant, and I bathed you about two hours ago, so you just have to get dressed."

The fact that she had managed to secure the services of the laundry department interested Gosseyn, but he did not comment on that mundane level. "You knew I was going to wake up?"

"Naturally."

She must have seen the questioning expression on his face, for she said quickly:

"Don't worry, the blurs start soon enough, now that you're awake."

"When?" He was tense at the thought of action.

"In about fifteen minutes."

Gosseyn began to dress more swiftly.

He spent five of the fifteen minutes slowly walking around the room. Then he rested for a minute, and for two minutes walked faster, swinging his arms with a free rhythm. He paused finally and looked down at Leej where she had sat down in a chair.

"What's all this about being lost in space?" he asked.

The eagerness went out of her eyes. "We're cut off," she said somberly. "Somebody set up a relay that destroyed the 'Distorter Matrix' for the nearest base. That happened at the moment when you became unconscious, after the 'matrix' had been used once."

The technical words sounded strange coming from her lips, but presently only the meaning remained. In that first moment after his awakening, when his alertness had been subnormal, he had only partially grasped the implications of what she had said. It wasn't that he hadn't understood. He had. But his mind had leaped to the related

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but comparatively unimportant idea that this explained why the destroyer had for so long failed to answer videophone calls.

Now, he felt a chill.

Cut off, Leej had said. Cut off four hundred light-years from the nearest base. If the ship's "Distorter" transport system had really been put out of commission, then they would be dependent on atomic drive with all the speed limitations of ordinary space-time travel.

He parted his lips to speak. Leej knew virtually nothing of science. The words she used must have been picked up during the past month. And they probably meant very little to her.

He had better find out as quickly as possible from more authoritative quarters the full extent of the catastrophe.

He turned and looked at the door, annoyed at the idea of being imprisoned. These people couldn't possibly suspect what he could do with this extra brain. And therefore locked doors were childish barriers, irritating when there were so many things to do. He turned to question Leej.

She said quickly: "It's not locked. We're not prisoners."

Her words anticipated his question. It made him feel good to be back again where such things were possible. He walked to the door.

It opened effortlessly. He hesitated, and then stepped across the threshold and out into the corridor. It was silent and deserted.

He took a "photograph" of the floor just outside the door, and because he was intent, a second passed before he realized that he must have used his extra brain automatically at just about the time predicted by Leej.

He returned into the room, and stood looking at her. "Was that it?" he said. "Was that the moment?"

She had climbed to her feet to watch him. Now, with a sigh, she sank back into her chair. "What did you do?"

Gosseyn had no objection to telling her—except for one thing. "If you should ever be captured," he explained, "a lie detector might obtain information from you that would be dangerous for us all."

He shook his head at her, smiling. From the expression on her face he knew that she knew what he was going to say. But he said it anyway: "How did you do it?"

"I snatched your blaster."

"You had a vision of the month ahead?"

She shook her head. "Oh, no. The blur that started then continued throughout the month. But it was I who saw you slump to the floor." She stood up. "It was all very simple, I assure you."

Gosseyn nodded. He could see what she meant. Captain Free and Oreldon would have stood blank for a second, not realizing what was happening.

"They offered no resistance," said

Leej. "And I had them carry you to our room. But just a moment now. I have some soup for you."

Our room, thought Gosseyn. It was a point which he had intended bringing up as gently as possible. He watched her as she walked swiftly out of the room. She came back a moment later, carrying a tray on which was a steaming bowl of soup. She was so friendly, so helpful; she took their relationship so completely for granted, that he changed his mind about speaking to her just then.

He ate the soup, and felt much better. But when he gave her back the tray, his thoughts were already turning back to their deadly situation.

"I'd better go and see Captain Free," he said.

As he walked along the empty corridor, Venus and all the mighty events of the galaxy seemed very far away.

Captain Free opened the door of his room, and Gosseyn's first impression was that he was ill. The stocky commander's face was very pale, and there was a feverish look in his brown eyes. He stared at Gosseyn as if he were seeing a ghost. The color rushed abruptly into his cheeks.

"Gosseyn," he said, and his voice was a croak, "what's been the matter with you? We're lost."

Gosseyn stared at him, wondering

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if this exhibition of the emotion of fear explained the inefficiency which had enabled him to capture the destroyer. He said finally, quietly: "We've got work to do. Let's do it."

They walked side by side along the silent corridors of the ship to the control room. In an hour he had the picture. Extra circuits had been built into the "matrices" that were in the three similarity slots of the control board. They were so interconnected that if any one of them was used once on a "break," the pattern in all three would be disorganized.

The "break" had occurred during the similarization which had also resulted in his becoming unconscious a month before. The disarranged "matrices" had been tuned to the patterns of the three nearest bases. Since they no longer worked, it was impossible to get to base by similarity means.

Gosseyn saw that Captain Free believed every word of his explanation of the operation of the system, and that was enough for him. He believed it, also, but in a more qualified fashion.

"Somebody," he told himself, "set up those circuits. Who?"

The problem was more subtle than might at first appear. It was reasonable to assume that the Follower was *responsible.* And yet the shadow-thing had admitted to Jansen when the two of them were on Venus that he was not mechanically minded.

The statement was not necessarily fact. But, still, people who used the products of the machine age did not automatically know how to set up relays to interfere with the operation of intricate machines.

Gosseyn walked over to the captain's desk and sat down. He was more tired than he cared to think about. But he dared not slacken his effort. In far-off space a fateful order had been given. Destroy Venus! Or rather destroy the people of the solar system.

Commands like that probably took time to carry out. But the time was running short.

After two minutes rest, he climbed to his feet. There was only one quick, logical method of solving their immediate problem. It seemed to him that he was ready to make it.

He "memorized" a number of key points aboard the ship as well as several power sources. And then he pressed the button that opened one of the sliding doors to the lower section of the ship. He motioned Captain Free to go ahead of him.

Wordlessly, they headed down the stairway.

It was a different world they came to. Here was laughter of men, and here were shouts and the sounds of many movements. For Gosseyn it meant a confusion of perception of neural flow.

The dormitory doors were open, and men stood along the corridors. They stiffened to attention as Captain Free came up, but relaxed after he had passed. Gosseyn said:

"Do the men know the truth?"

The commander shook his head. "They think they're making a trip between two planets. I've been in daily touch with the noncommissioned officers in charge, and everything is fine."

"They didn't even worry about the connecting doors being locked for a month?" Sharply.

"They only go upstairs when ordered, and that usually means work. So I don't think they'll be worried."

Gosseyn made no comment on that. His theory was that somebody had gone up without orders, and worked hard indeed. He could possibly have located the guilty man by questioning four hundred and eighty separate individuals with a lie detector. But while he did so, laboriously, Enro's fleet would arrive in the solar system, radioactive isotopes would be sprayed down upon the misty skies of Venus and Earth, and three billion people would die horribly without having received a single advance warning.

The prevision was without benefit of Predictors, but it was nightmarishly realistic none the less. Gosseyn shuddered, and swiftly put his attention back to the job at hand. At his suggestion, Captain Free ordered a general return to dormitories.

"Shall I have the doors locked?" he asked.

Gosseyn shook his head.

"There are several exits to this place," the commander persisted. "I presume you're down here for a purpose. Shall I have guards posted at the doors?"

"No," said Gosseyn.

The captain stared at him uneasily. "I'm worried," he said. "There's no one up there who's free except the Predictor woman. It'd be unpleasant if someone slipped up the stairway and closed the connecting doors between the two sections."

Gosseyn smiled grimly. The other wasn't even close in his estimate of the situation. *That* wasn't the danger. "It's a point I've considered," was all he said.

They went into each dormitory in turn. While the noncommissioned officers and Captain Free made a roll call, Gosseyn talked to individuals. He made a pattern out of the task. "What's your name? How are you feeling? Worried about anything?" Each time for each question he watched not only the man's facial responses but the neural flow that came from him like an aura.

It made a fast job of it, particularly as the crew members began to answer, "Feeling all right, Doc." "Yes, Doc." Gosseyn did not discourage the assumption that he was a psychiatrist.

He was in the third dormitory when a relay closed in his extra brain. Somebody was climbing the stairway that led to the upper section of the ship. He turned to speak to Captain Free, but the commander was not in sight. A noncommissioned officer stepped forward smartly.

"The captian went to the washroom. He'll be right back."

Gosseyn waited. It would take, he estimated, one and a half minutes for the Follower's agent to go from the stairway to the control room, and about an equal length of time to the "Distorter" room from which the Predictors had been sent to their assigned stations. Since all such subsidiary "Distorters" operated through the main "matrix," the control room *must* be first.

He would have liked to talk to Leej, but to bring her down by similarity would be too startling. And, besides, there wasn't time. He said something about being right back, stepped out into the corridor, crouched down, and in that position similarized himself behind the captain's desk in the control room.

Cautiously, he peered over the top of the desk, but for a while he made no effort to move, simply knelt there and watched. The man was removing the panel of the "Distorter" board directly over the similarity slots. He worked swiftly, and every little while looked over his shoulder toward one or the other of the two entrances. And yet Gosseyn had no impression of frantic haste. It was not surprising. Such traitors as this always had some extra quality of nerve or boldness that set them apart from their fellows. Such a man would have to be handled very carefully.

As he watched, the other lifted down one of the metal panels. Swiftly, he drew out the "matrix" in the slot, laid it on the floor, and came up immediately with a curved, glowing shape. Because of its shininess, it was so different from the other that a moment passed before Gosseyn recognized it. A "Distorter" "matrix," not dead, but energized.

He stepped out of his hiding place, and walked toward the control board. He was about ten feet from it when the man must have heard him coming. He stiffened and then slowly turned.

"I beg your pardon, sir," he said, "but I was sent up here to do some work on this—" He stopped the lie. Relief flooded his face. He said: "I thought you were one of the officers."

He seemed about to turn back to the board when Gosseyn's expression must have warned him. Or perhaps he was taking no chances. His hand moved convulsively, and a blaster appeared in it.

Gosseyn similarized him thirty feet from the control board. He heard the hiss of the blaster, and then a cry of amazement, behind him. He turned swiftly, and saw that the other was poised rigid in every muscle, facing away. In the man's tense hand he caught the glint of the blaster's stock. Swiftly, he "photographed" it, and as the other swung jerkily around, he similarized the weapon into his own hand. He was deliberate now.

He got the maniacal terror he wanted, but he got something more also. Snarling like an animal, the man made an attempt to reach the "Distorter" switches. Three times Gosseyn similarized him back to his

starting point. The third time, abruptly, the other ceased his mad effort. He stopped. He snatched a knife from an inner pocket, and before Gosseyn could realize his intention, plunged the blade into his own left breast.

There were sounds of running footsteps. Captain Free, followed an instant later by Leej, came darting into the control room. "What happened?" Captain Free asked breathlessly.

He stopped short, and he stood by wordlessly as the traitor grimaced at them, shuddered—and died.

The commander identified him as an assistant to the communications engineer. And verified that the "matrix" the fellow had put into the similarity slot *was* for the base four hundred light-years away.

There was time, then, for explanations. Gosseyn offered the main points of his rationalization that had led him to set his trap.

"If it was an agent of the Follower, then he must still be aboard. Why? Well, because no one was missing. How did I know that? You, Captain Free, kept in touch with the noncommissioned officers in charge of dormitories, and they would surely have reported it if a man was missing.

"*So he was still aboard.* And for a whole month he waited in the lower part of the ship, cut off from the control room. You can imagine the ferment he was in, for he surely

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hadn't planned on waiting so long before making his escape. Why would he have a way of escape? I think it'd be because a man would always include a way of escape when making his plans, and would only accept the idea of death if he felt himself trapped.

"With all those pressures working on him, he wasted no time getting upstairs when the doors opened.

"Of course, the new 'matrix' would also have a wrecking circuit in it, that would operate the moment he used it to escape. But there's one little point about that which puzzles me. Captain Free tells me we'll have to stop at a base about eighteen thousand light-years from here, and pick up the 'matrices' that will take us to Venus at r36000 theta 272 Z1400—, and when we get there we're going to have to have our papers in order.

"My little point is this, how did a mechanic expect to turn up at base *without release papers of some kind?* You might say the Follower would protect him, but that isn't really logical. I don't think the Follower would care to have Enro know that he was responsible for cutting off Predictors from the fighting fleets for a whole month."

He looked up. "As soon as you've fixed up that circuit, captain, come and see me. I'll be in my room."

XVI.

Abstracts

For the sake of sanity, learn to evaluate an event in terms of total response. Total response includes visceral and nervous changes, the emotional reaction, the thought about the event, the spoken statement, the action repressed, the action taken, et cetera.

As soon as he reached the bedroom, Gosseyn took off his shoes and lay down on top of the bed. He had been feeling the nausea coming on for more than an hour. And the great effort of trapping the saboteur had been a strain almost too much for him to maintain.

He was anxious not to show weakness. And so it was pleasant to feel the strength flowing back into his body. After twenty minutes of lying with closed eyes, he stretched, yawned, and opened his eyes.

He sat up with a sigh. It was like a signal. Leej came in carrying another bowl of soup. The timing of it obviously indicated prevision. Gosseyn ate the soup thinking about that, and he was just finishing it when Captain Free came into the room.

"Well," he said, "we're all set. Give the signal and we'll start."

Gosseyn glanced at Leej, but she shook her head. "You can't expect anything from me," she said. "As far as I can see, there's nothing wrong, but I can't see as far as we're going."

Captain Free said: "We're lined up to go through the remainder of Decant Nine to the nearest marginal base in Decant Eight. There, of course, we have to stop."

"Approach that base with a 'break'," Gosseyn said, "and then we'll talk some more."

Eighteen similarity jumps and slightly more than ten minutes later, according to the time that seemed to have passed, Captain Free came back into the cabin.

"We're six and three quarter light-years from the base," he said. "Not bad. That puts us within eleven thousand light-years of Venus."

Gosseyn climbed off the bed, and walked stiffly to the control room. He sank into the lounge in front of the transparent dome. The question in his mind was, should they flash straight into the base? Or should they make their approach overland? He glanced questioningly at Leej.

"Well?" he said.

The young woman walked over to the control board. She settled into the circular chair, turned, and said: "We're going in." She pulled the lever.

The next second they were inside the base.

There was dimness all around. As his eyes became accustomed to the lesser light, Gosseyn saw that the enormous metal cave was much larger than the base of the Greatest Empire on Venus.

Gosseyn turned his attention to Captain Free. The commander was giving instructions over the videophone. He came presently over to Gosseyn, just as Leej also walked up. He said:

"An assistant of the port captain will come aboard in about half an hour. Meanwhile I've given orders for the new equipment to be brought into the ship. They accept that as routine."

Gosseyn nodded, but he was thoughtful as he studied the officer. He was not worried to any extent as to what Captain Free might be able to do against his interests. With Leej and himself co-ordinating to frustrate a threatening danger before it was scheduled to happen, risks from men and machines need scarcely be thought about.

Still, the man seemed to be cooperating not as a prisoner but as an open partner. He had no desire to call the other's attention to his neglect of duty as an officer of the military forces of the Greatest Empire, and yet, some understanding seemed essential.

He decided to be frank. After he had finished, he had to wait for nearly a minute. Finally, Captain Free said:

"Gosseyn, a man in your position, with your special power, can scarcely have any idea of what hundreds of thousands of officers in the Greatest Empire went through when Enro took over. It was very skillfully done, and if the others were like me, then they must have felt trapped.

"It was virtually impossible to know what to do. There were spies everywhere, and the overwhelming majority of the crews were for Enro. When he was war minister

he had his opportunity to place his traitors in key positions everywhere."

Captain Free shrugged. "Very few of us dared show resistance. Men were being executed right and left, the dividing line seeming to be whether or not you made open comment. As a result of a lie detector test, I was listed as a doubtful person, and warned. But I was allowed to live because I had not resisted in any way."

He finished, "The rest was simple enough. I rather lost interest in my career. I was easily wearied. And when I realized what this trip to Yalerta meant, I'm afraid I let discipline go by the board. It seemed to me that the Predictors would insure an Enro victory. When you came along, I was shocked for a few minutes. I saw myself courtmartialed and executed. And then I realized you might be able to protect me. That was all I needed. From that moment I was your man. Does that answer your question?"

It did indeed. Gosseyn held out his hand, "It's an old custom of my planet," he said, "in its highest form a method of sealing friendships."

They shook. Briskly, Gosseyn turned to Leej.

"What's on the time horizon?" he asked.

"Nothing."

"No blurs?"

"None. The papers of the ship show that we are on a special mission. That mission is vaguely stated, and gives Captain Free considerable authority."

"That means we get out of the base without the slightest thing going wrong?"

She nodded, but her face was serious. "Of course," she said earnestly, "I'm looking at a picture of the future that you could alter by some deliberate interference. For instance, you could try to make a blur just to prove me wrong. I really have no idea what would happen then. But my picture says there is no blur."

Gosseyn was interested in experiments, but not at the moment. Still, there were other aspects of the situation.

The whole problem of prevision seemed to become more puzzling the further he looked into it. If Enro, the Predictors and Gilbert Gosseyn himself, were all products of the same kind of training, then why couldn't he who had been in an "incubator" thirty times as long as a Predictor, and more than a hundred times longer than Enro—why couldn't he see across distance as Enro did, and into the future like the Predictors?"

Training, he thought. His. For they had received none. But he had been given flawed training, for a purpose which later had to be changed.

As soon as he had warned the Venusians, he'd have to consult Dr. Kair and other scientists. And this time they'd work on the problem

with a new understanding of its possibilities.

It was just a few minutes less than an hour after their arrival that they flashed out of the base. Ten jumps and ten thousand light-years brought them near Gela.

Next stop, Venus.

At Gosseyn's suggestion, Leej set the "break" needles. Rather, she spent several seconds setting them. Then abruptly she leaned back, shook her head, and said: "There's something wrong."

"It's beyond my range, but I have a feeling that we won't get as close to the planet as we did when we went into that base. I have a sense of—interference."

Gosseyn did not hesitate. "We'll phone them," he said.

But the videophone and plate were silent, lifeless.

That gave him pause, but not for long. There was really nothing to do but take the ship through to Venus.

As before, the similarity jump seemed instantaneous. Captain Free glanced at the distance calculators, and said to Leej:

"Good work. Only eight light-years from the Venusian base. Can't do much better than that."

There was a clatter of sound, a bellowing voice: "This is the roboperator in charge of communications —an emergency!"

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(*Continued from page 5*)

of the most important tools of the nuclear physicist working with neutrons is an indium foil; indium is a rare element, and once was exceedingly difficult to purify sufficiently. The radiochemists separated it, and have developed separation techniques of fantastic power. Where once it took ten thousand fractional crystallizations to separate two rare-earth elements, the chemists have developed an ion-exchange contraption so incredibly specific that a single passage of the raw material through the column is sufficient to get a fifty percent yield of spectroscopically pure rare-earth element.

There are several divisions of the chemistry to be done at Brookhaven—and the other atomic research centers. Obviously, one of the major jobs is research on the chemical properties of uranium, thorium, neptunium, plutonium, americium and curium—the plain, ordinary chemical properties, such as determining the solubility of americium sulfate. The modern chemist is separated from the modern nuclear physicist primarily by this; the chemist studies the properties of the outer electron rings, while the nuclear physicist confines himself to the nucleus itself. Since chemical reactions are determined by the physics of the electron-shell structure, physical measurements such as infrared spectroscopy, magnetic properties, and the like are in the chemist's field. At Brookhaven they are making measurements of the magnetic properties of uranium salts, therefore.

A second function of the radiochemists is that of identifying the elements the nuclear physicists produce. The work of Hahn was, of course, precisely that; he identified barium as one of the products of uranium bombarded by neutrons, and thereby tipped off the nuclear physicists. The present radiochemists are trying, among other jobs, to determine *all* the fission products. Apparently that "all" includes more than half the elements in the table; the job wouldn't be easy in any case, but since many of the isotopes produced are short-lived, highly dangerous to work with, and present in minute quantity, the problem is both difficult, dangerous, and necessarily done in a desperate hurry! (One reason why they *had* to develop the one-pass separation technique. You can't take a year making ten thousand fractional crystallizations when the element you're trying to isolate lasts only six hours!)

Another major project is the study of such fundamental questions as "Why is a catalyst," and "What is a surface." Most of the really basic questions of Nature sound nonsensical or foolish when directly expressed—and take the most profound understanding to answer. The understanding of why molecules behave as they do is, of course, the basic problem of all

chemistry; with radioactive tracers for tools, with constantly improving chemical techniques to take maximum advantage of the tools, with separated stable isotopes and mass spectrometers to extend the technique to elements without usable radioactive isotopes, Brookhaven can discover much.

Finally, there is the chemical function of studying specific chemical compounds—really the function of greatest interest of all. When a man studies the reactions of the amino acids, we have, actually, one group of complex amino acids studying the behavior of another, simpler group. This problem isn't so broad, so fundamental, as the previous group—but it's more personal. Just a slightly better balancing of that complex of amino acids that is a man should extend its period of dynamic imbalance—known as life—by a very large percentage.

The physics department at Brookhaven is not yet in full swing, since the pile isn't yet in operation, and the super-super-cyclotron isn't built. Most of the accelerator project is in the stage of design and calculation. They have a rather ambitious program; the little widgit they're building is intended to deliver something over three begavolt particles —3,000,000,000-plus electron-volt smashes against the particles of a nucleus. With such energies, incidentally, you do not cause proton to strike a carbon nucleus; you cause a proton to strike one of the protons in the carbon nucleus. The difference is somewhat like this: if you toss a marble at a balloon, you hit the balloon, which bounces away. If you toss the marble with a high-power rifle, however, you don't hit the balloon—in effect you hit a particular area of the rubber, and that area takes the impact so suddenly that it has no time to transmit the impact before it is smashed out of the way.

The new device now in the design stage involves a simple development of the pre-war cyclotron, enlarged to have a sixty-foot diameter magnet. This simple enlargement, however, runs into several dozen engineering problems of such magnitude as to constitute a wholly new problem. First, the pre-war cyclotron used about a sixty-inch magnet, and the high-voltage drive that accelerated the particles was supplied by a radio-frequency oscillator. This radio-frequency oscillator, however, ran about four times the power of the largest transmitter the Federal Communications Commission allows a broadcaster to operate. It took some two hundred thousand watts of radio power to operate that "small" cyclotron. The half-million volt potentials involved were extremely difficult to handle.

At sixty-foot size the magnet would have to weigh something over ninety thousand tons. It could not be cast, transported, machined, or paid for. The 184-inch Berkley cyclotron is about the largest practicable. That, on the pre-war plan,

would have developed about one hundred million volts, using the most powerful oscillator they could set up.

They did a little engineering during the war period, and invented the synchro-cyclotron principle; the 184-inch cyclotron, when finally completed, uses a smaller oscillator than the earlier, much smaller cyclotrons, and gets four times the voltage it was originally planned for. Still, the billion-volt range now needed calls for more magnetic field than can be developed in a practicable magnet of the type used in cyclotrons.

Hence the engineering problems. This will have a ring-magnet. A ring of separate, relatively small—only six feet high!—electromagnets will be set side-by-side to form a ring sixty feet in diameter, and a doughnut shaped tube—with very little doughnut and an extremely large hole!—will pass through the magnetic jaws of this set of magnets. That brings the ninety thousand ton requirement down to a reasonable figure, and the power requirements down too. The current required to magnetize ninety thousand tons of steel to the necessary degree would be so great that, when the magnet was shut off, the energy would have to be drained off by pumping electric power back into the power line!

Of course, making that ring of magnets is far simpler, too, than attempting any such thing as a single ninety thousand ton magnet. Relatively speaking, it's a snap. It's to engineer that relative-snap that a large number of research men are wearing their hair thin now. Of course, you can make the magnet by simply piling up flat steel plates, and winding wire around them. Unfortunately, "flat" in this sense is something that doesn't exist; the trick is to get specifications that the steel mill can actually make that are still close enough to what you need so that the finished machine will work, even if not what you actually wanted. Then, too, it would be nice to use for your magnet metal, one of the high-permeability iron-cobalt-nickel alloys, but you actually use carbon steel because the cost isn't quite so fantastically high. The engineering of a high-voltage accelerator consists of a series of compromises between physics and physical mechanisms—and the ability of the physicist shows in how effective a compromise he achieves.

For the interest of the radio-electronics people reading this, one little problem: the RF driver powering the accelerator must deliver eighty amperes of RF at low impedance—and as a broad-band amplifier into a nonresonant load! They need something like 100 Kw in a final amplifier covering a frequency range from about 300 Kc to 4.3 Mc. The requirement is—since magnetic acceleration is used—that there be eighty amperes of RF; the wattage is relatively unimportant. How would you do it?

THE EDITOR.

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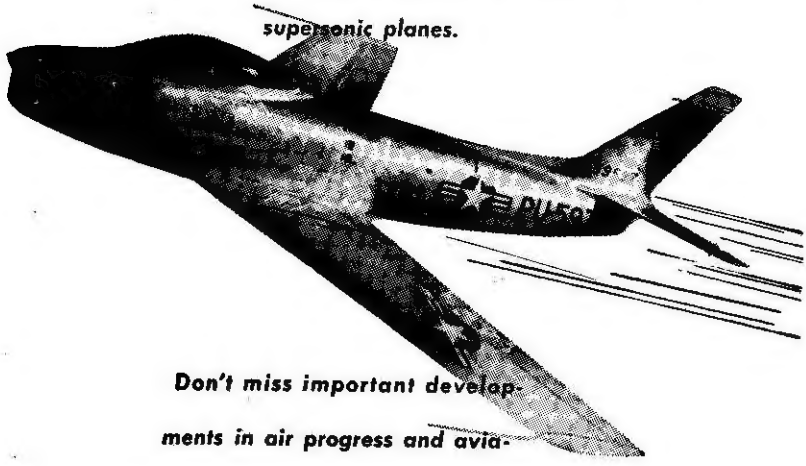

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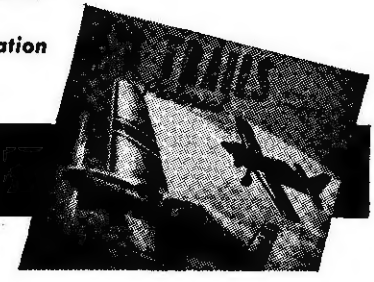

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